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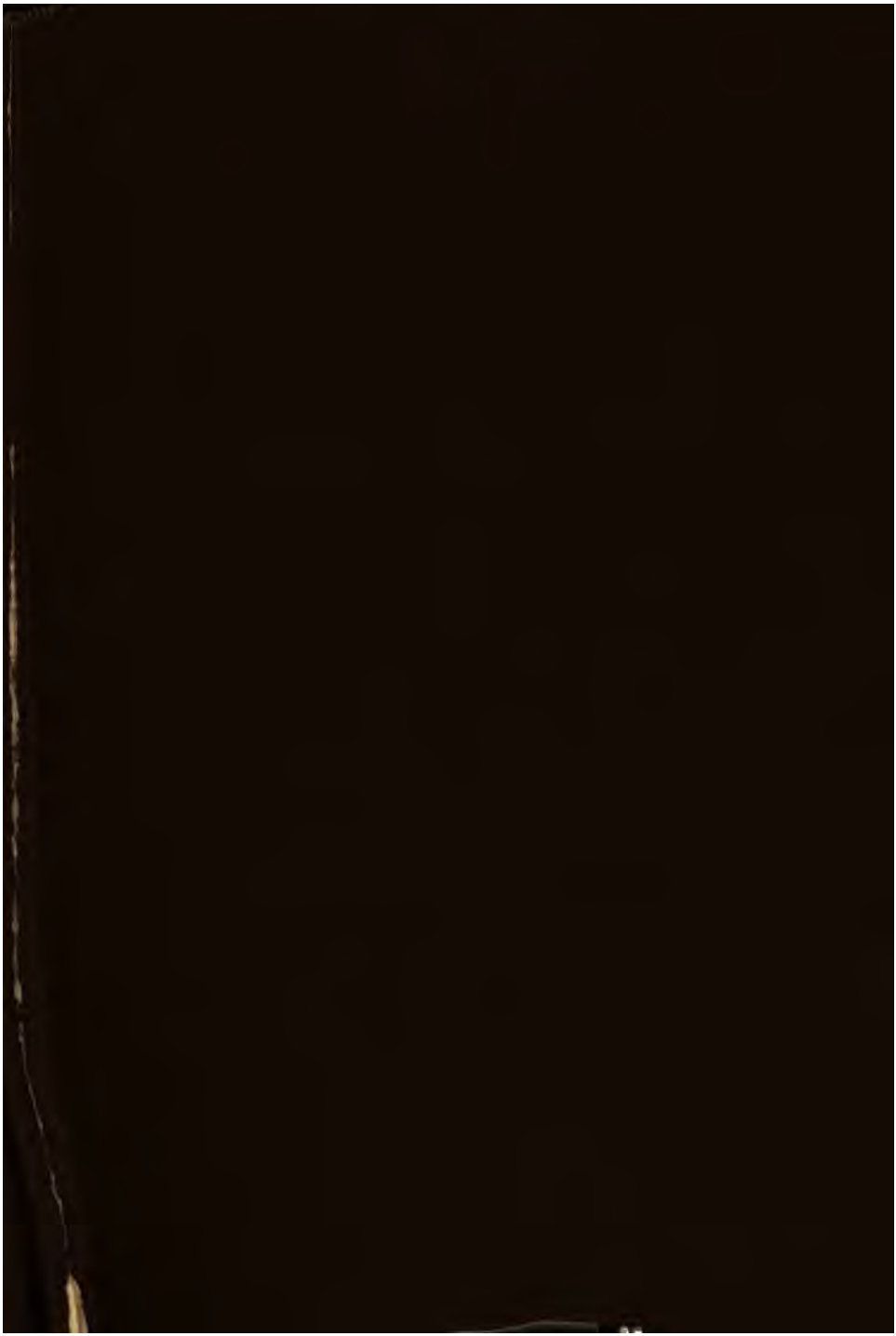

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THE TESTS

OF THE

VARIOUS KINDS OF TRUTH

BEING

A TREATISE OF APPLIED LOGIC

BY

JAMES McCOSH, D.D., LL.D., D.L.
Ex-President of Princeton College, N. J.

NEW YORK
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PREFACE.

THE age may be characterized as one of *unsettled* opinion. Our ambitious youths are not satisfied with the past, its opinions, and practices. Authority is not worshiped by them; they have no partiality for creeds and confessions. They do not accept, without first doubting, the truths supposed to be long established. In searching into the foundation of the old temples they have raised a cloud of dust and left lying a heap of rubbish. It is an age out of which good and evil, either or both, may come, according as it is guided. We may entertain fears, for it is dancing on the edge of a precipice down which it may fall. We may cherish hope, for it is an inquiring age.

Every form and phase of opinion seeks to have a philosophy, in which it may embody and express itself and by which it may be defended. Agnostics is the shape or figure which the doubting and hesitating spirit takes. It is not a new heresy. It has been held by a few in every age; it is now espoused by many, provisionally, till something more solid or

showy is propounded. It used to be called nescience, which maintains that nothing can be known, and nihilism, which holds that there is nothing to be known. It is of little use trying to argue with it, for it allows us no premises as a ground on which to start, and has no body or substance that we can attack. It is easy to show that it is suicidal. It is an evident contradiction to affirm that we know that we can know nothing. But when we have demonstrated this we have not destroyed it any more than we have killed a specter by thrusting a spear into it; for its defense is that all truth is contradictory. The best way of dealing with it is to allow it to dance as it may, like the shadows of the clouds, and, meanwhile, to found and build up truth and set it up before the mind, that it may be seen in its own light. It is well known that when we see a solid object through and beyond a specter the specter melts away and disappears. So it will be with agnosticism—it will vanish when we fix our eyes upon the truth.

But meanwhile an immense number and variety of crude views and opinions on the most momentous subjects, such as morality and religion, are set before the young and pressed upon their acceptance. In consequence they often feel a difficulty in knowing what to believe, and they may be led to

believe too little or too much. In these circumstances it is of vast importance to provide them with tests which may enable them to distinguish between reality and fiction and settle them in the truth.

This is what is attempted in this work, which is meant for those who wish for their own satisfaction to know on what foundation the truths on which they are required to believe rest.

It is hoped that, being a treatise on what Kant calls applied logic, which may be quite as useful as primary or formal logic, and announcing as it does, the laws of Inductive as well as Deductive thought, this work may be profitably used as a text-book in those colleges and upper schools where there is not time or taste to study metaphysics, or the technicalities of Formal Logic, or the full applications of Inductive Logic.

These papers were first delivered and then published as Lectures in Ohio Wesleyan College, on the foundation established by my estimable friend, Dr. Merrick.

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INTRODUCTION.

WE have truth when our ideas are conformed to things. The aim of this work is to show that there is truth, that truth can be found, and that there are tests by which we may determine when we have found it. We do not propose to guide inquirers in any particular department of investigation; this can best be done in introductions to the books and lectures treating of the several branches of knowledge.

Kant and the German metaphysicians have shown again and again that there is no one absolute criterion to settle all truth for us; that will determine, for example, at one and the same time, whether there is a fourth dimension of space, whether the planet Jupiter is inhabited, where the soul goes at death, and what kind of crops we are to have next year. But it can be shown that there are truths which may be ascertained and that there are criteria which prove when they are so; and these clear, sure, and capable of being definitely expressed. But the test which settles one truth for us does not neces-

sarily settle all others, or any others. It is necessary to distinguish between different sorts of truth, and we should be satisfied when we find a test of each kind. I am convinced that historical, scientific, and logical investigation has advanced so far that we can now enunciate criteria for every kind of truth. The aim of the criteria, it should be noticed, is not so much to help us to discover truth as to determine when we have found it.

LECTURE FIRST.

TRUTHS TO BE ASSUMED.

I.

THE mind must start with something. There are things which it knows at once. I know pleasure and pain. I do more: I know myself as feeling pleasure and pain. I know that I am surrounded with material objects, extended and exercising properties. I know, by barely contemplating them, that these two straight lines cannot contain a space. These are called first truths. There must be first truths before there can be secondary ones; original before there can be derivative ones. Can we discover and enunciate these? I believe we can.

We are not at liberty, indeed, to appeal to a first principle when we please, or because it suits our purpose. When we are left without evidence we are not therefore allowed to allege that we need no evidence. When we are defeated in argument we are not to be permitted to escape by falling back on what is unproved and unprovable. It is true that we cannot prove every thing, for this would

imply an infinite chain of proofs every link of which would hang on another, while the whole would hang on nothing—that is, be incapable of proof. We cannot prove every thing by mediate evidence, but we can show that we are justified in assuming certain things. We cannot prove by any external circumstance that two straight lines cannot inclose a space, but we can show that we are justified in assuming it. We are to "prove all things." But there are some things which have their proof in themselves. We discover it by simply looking at the things. It is thus that we know that we exist; that the shortest distance between two points is a straight line; that hypocrisy is a sin. We need no external evidence. The evidence is in the thing; in the very nature of the thing. We do not require mediate, we have immediate proof.

II.

This kind of truth is to be distinguished from two others for which we require what is called mediate proof. First, there are cases in which we get this by simply thinking. A truth being allowed we infer something else from it. Thus, being assured that all men are responsible, we argue that heathens, being men, are responsible. Secondly, in other cases we need observation and a gathering of facts,

that is induction; in order to the discovery of a general fact or law. It is thus that we have discovered that a year consists of so many days; thus that Newton discovered the law of gravitation, and Dalton that of definite proportions in the composition of bodies. These two last kinds of cases, which may be called the logical and inductive, differ from the first, which may be called the metaphysical. In this chapter first truths are treated of; in those that follow, reasoned and observational truths. In all the three our aim is to discover the tests.

III.

The evidence of the first class of truths is discovered by what is called Intuition, which looks directly on the objects; the truth is therefore called Intuitive. It is also called First, or Primary, as it is the first in the order of nature and things. It is designated as Fundamental in that it bears up other truths. It is described as Necessary inasmuch as, perceiving the objects directly, we cannot be made to believe otherwise. Since the publication of *Kant's Kritic of Pure Reason* it is more frequently described as *a priori* in that it is known prior to a gathered experience, the truth discovered by which is called *a posteriori.* It may be spoken of as Original, as opposed to what is Derived. These are not

the most prominent truths to the ordinary observer; they lie deep down in the soul; they are the foundation on which other truths are laid.

They are numerous and varied. Some of them, and these the first and original ones, are cognition of things. Thus we all know body, with its properties, and self or spirit, with its properties. Some of them are beliefs—such as our belief in space and time and in their continuity. From these arise judgments, in which we compare two or more cognitions and beliefs and discover a relation between them. These judgments may be arranged under eight heads. In identity, we declare that it is impossible to be and not to be at the same time. In comprehension, we declare that the whole is equal to the sum of its parts. In resemblance, we affirm that what is true of a class must be true of all the members of the class. We know that body is in space. We know that all events happen in time. In quantity we are sure that equals added to equals are equals. In contemplating things as acting we maintain that every property implies a substance. When we see an effect we are sure that it has had a cause. These are intellectual cognitions, beliefs, and judgments. But we have also primary moral convictions. We know at once the distinction between moral good and evil; we declare love to our neigh-

bors to be a virtue binding upon us, and we need no one to argue with us to convince us that to tell a lie or cheat our neighbor is evil.

IV.

These primitive convictions run through our thoughts, ideas, and acts. Every man acts upon them. We are sure that we exist and that we have a body, extended, and acting on us and other objects. We know that we are the same persons to-day that we were yesterday. The creditor, when he receives only part of what is owing him, tells his debtor that this is less than the whole. When a man knows that spring, summer, autumn, and winter make up the seasons he expects when the three first are past that winter is coming. A farmer does not propose to inclose a field by two straight fences. When we awake from sleep we are confident that we have been alive all the time since we fell asleep. The clerk in his calculations acts on the principle that equals subtracted from equals are equals. When we see a body we are convinced that it has properties. When we see a house on fire we are sure it has been ignited. The circumstance that all men act upon these principles led the Scottish school of metaphysicians to call them principles of common sense.

V.

We may assume all such truths. They do not need proof. A man who would seek it must be beside himself. He may be compared to one going out with a taper to see the sun. These truths shine in their own light. We may use them in all our thoughts and inquiries and in all our arguments with our fellow-men, provided we properly enunciate them.

A man had better assume his own existence. He might find it difficult to establish it by argument. But if he is determined, by all means let him try it; he will only be impressed the more with the impossibility of his doing it. How will he do it? To what will he appeal? How will he begin? With the testimony of his neighbors? He will find that he has clearer proof of his own existence than of that of his neighbor, and that he cannot prove the existence of his neighbors till he first assumes his own. It is the same with all other self-evident truths. We cannot prove them by other truths, but we may use them to prove other truths.

VI.

Let us seek to determine precisely the nature of these truths. They may be viewed under three aspects—aspects of one and the same thing.

1. They are *Perceptions of Things.* We perceive that body is extended, and that it exercises properties, such as resistance to our energy and to other bodies. We are conscious of self as thinking and feeling. We believe that space and time extend beyond what we observe of them. We decide at once that contradictions cannot both be true; that the abstract implies the concrete; that universals imply singulars; that we cannot be both here and in China at the same time; that two halves make up the whole; that properties imply a substance; that a change is produced by an adequate power. We look on self-sacrifice, for a good cause, as good, and treachery as an evil. All these perceptions are direct, and are in consciousness.

2. They are *Regulative Principles.* I do not believe that there is any such thing as innate ideas. Locke exploded them forever. But the mind of the child is not altogether a nonentity or a blank. It has powers or capacities ready to be exercised on the appropriate objects being presented. These are in the mind as gravitation lies in matter, as life remains in the seed all winter, as seeds have remained, with life in them, in the tombs of Egypt for thousands of years.

Mr. Mill has shown that all the powers in nature are tendencies. They tend to act according to

their nature. Thus oxygen tends to join in definite proportions with hydrogen to form water; bodies attract other bodies to them inversely according to the square of the distance. Our ideas tend, unless interfered with by external objects, to follow each other in a certain order; when two ideas have been in the mind together, the one tends to cull the other, and like suggests like. In much the same way the powers of intuition abiding in the mind ever tend to act, and are called forth by objects. In a sense, they so far direct and control the mind. Of the principle we are not conscious, but we are conscious of its exercises, which are the perceptions of which I have been speaking under last head.

3. They may become *Axioms.* All the perceptions of which I have been discoursing are in the first instance singular or individual, and not abstract or general. We do not say of every two straight lines that they cannot inclose space, but of these two straight lines before us that they cannot inclose a space. We do not at first announce that all men are responsible, but of ourselves or some other person that he is responsible. I do not formally proclaim the metaphysical principle, every effect has a cause, but of this particular effect, the burning of a rick of hay, that it has had a cause. But then we can generalize our individual perceptions. We see

that what is true of the object or case before us is true of the same object or cases every-where and in all places. We now reach general maxims true of the objects at all times and in all circumstances. Fraud cannot be good on the planet Earth, or the planet Jupiter, or the dog-star Sirius. Parallel lines, we see, will never meet in earth, or star, or the space beyond. We have now such axioms as those of Euclid. We have moral maxims such as the Ten Commandments, and the precepts in the Sermon on the Mount.

VII.

But what we have specially to do here is to enumerate the criteria by which such truths may be tried, and which will settle for us whether we are entitled to assume without any mediate proof what may be presented to us by ourselves or others for our acceptance.

SELF-EVIDENCE is the primary test of that kind of truth which we are entitled to assume without mediate proof. We perceive the object to exist by simply looking at it. The truth shines in its own light, and, in order to see, we do not require light to shine upon it from any other quarter. We are conscious, directly, of self as understanding, as thinking, or as feeling, and we need no indirect evidence.

Thus, too, we perceive by the eye a colored surface, and by the muscular touch a resisting object, and by the moral sense the evil of hypocrisy. The proof is seen by the contemplative mind in the things themselves. We are convinccd that we need no other proof. A proffered probation from any other quarter would not add to the strength of our conviction. We do not seek any external proof, and if any were pressed upon us we would feel it to be unnecessary—nay, to be an encumbrance, and almost an insult to our understanding.

But let us properly understand the nature of this self-evidence. It has constantly been misunderstood and misrepresented. It is not a mere feeling or an emotion belonging to the sensitive part of our nature. It is not blind instinct, or a belief in what we cannot see. It is not above reason or below reason; it is an exercise of primary reason prior, in the nature of things, to any derivative exercises. It is not, as Kant represents it, of the nature of a form in the mind imposed on objects contemplated and giving them a shape and color. It is a perception, it is an intuition of the object. We inspect these two straight lines, and perceive them to be such in their nature that they cannot inclose a space. If two straight lines go on for an inch without coming nearer each other, we are sure

they will be no nearer if lengthened millions of miles as straight lines. On contemplating deceit we perceive the act to be wrong in its very nature. It is not a mere sentiment such as we feel on the contemplation of pleasure and pain; it is a knowledge of an object. It is not the mind imposing or superinducing on the thing what is not in the thing; it is simply the mind perceiving what is in the thing. It is not merely subjective, it is also objective—to use phrases very liable to be misunderstood; or, to speak clearly, the perceiving mind (subject) perceives the thing (object). This is the most satisfactory of all evidence; and this because in it we are immediately cognizant of the thing. There is no evidence so ready to carry conviction. We cannot so much as conceive or imagine any evidence stronger.

NECESSITY is a secondary criterion. It has been represented by Leibnitz and many metaphysicians as the first and the essential test. This I regard as a mistake. Self-evidence comes first, and the other follows and is derived from it. We perceive an object before us and know so much of its nature; and we cannot be made to believe that there is no such object, or that it is not what we know it to be. I demur to the idea so often pressed upon us that we are to believe a certain proposition because we

are necessitated to believe in it. This sounds too much like fatality to be agreeable to the free spirit of man. It is because we are conscious of self that we cannot be made to believe that we do not exist. The account given of the principle by Herbert Spencer is a perverted and a vague one: all propositions are to be accepted as unquestionable whose negative is inconceivable. This does not give us a direct criterion as self-evidence does, and the word inconceivable is very ambiguous. But necessity, while it is not the primary is a potent secondary test. The self-evidence convinces us; the necessity prevents us from holding any different conviction.

CATHOLICITY or Universality is the tertiary test. By this is meant that it is believed by all men. It is the argument from catholicity, or common consent—the *sensus communis.* All men are found to assent to the particular truth when it is fairly laid before them, as, for instance, that the shortest distance between two points is a straight line. It would not be wise nor safe to make this the primary test, as some of the ancients did. For, in the complexity of thought, in the constant actual mixing up of experiential with immediate evidence, it is difficult to determine what all men believe. It is even conceivable that all men might be deceived

by reason of the deceitfulness of the faculties and the illusive nature of things. But this tertiary comes in to corroborate the primary test, or rather to show that the proposition can stand the primary test which proceeds on the observation of the very thing, in which it is satisfactory to find that all men are agreed.

Combine these and we have a perfect means of determining what are first truths. The first gives us a personal assurance of which we can never be deprived; the second secures that we cannot conquer it; the third, that we can appeal to all men as having the same conviction. The first makes known realities; the second restrains us from breaking off from them; the third shows us that we are surrounded with a community of beings to whom we can address ourselves in the assurance of meeting with a response. The first is the most satisfactory, as it brings us closest to things. The second is the most definite and decisive, as it admits of no denial. The third brings us into closest relationship with our fellow men and gives us confidence in addressing them. The three constitute a treble cord which cannot be broken.

It should be noticed that these tests apply not only to our primitive knowledge but to our primitive beliefs. We have such beliefs. We believe in the

existence of things which we cannot know by the senses, which we cannot see or hear, smell or taste or touch. We believe in space and time as stretching away beyond our ken. We believe in the infinite, though we may not be able fully to comprehend it. Our beliefs require to be tested fully and as much as our knowledge. A large number of men and women, even some who are shrewd and wise, are apt to cherish fancies which have no realities corresponding to them. There are classes of people who are particularly addicted to such visions. You hear them say, "I feel this to be true. I must believe it." A more cultivated set of people tell you this is so interesting that I must cleave to it. There are numbers thus led into great extravagances of credence which expose them to ridicule or land them in folly, or, it may be, in very serious errors or mistakes.

Now there is a method of keeping people from being allured into bogs by these will-o'-wisps. We are to try the spirits whether they are of God. We have a reliable means of trying them. We may, we should, inquire whether what we are invited to assume is self-evident truth and not a mere fancy; whether we are necessitated to believe it as we look at the things, or whether we may not be led to adopt or reject it by the wishes of the heart;

whether it is held by man as man, or merely by people with idiosyncrasies and prejudices. Our feelings were never meant to be the tests of truth, though they may prompt us to seek it, may irradiate it so as to make it more attractive, and instil life into the soul and thereby prompt to action.

It is to be admitted that there is a mysticism which is very fascinating and at times elevating, as, for instance, in the pages of Thomas à Kempis. But it may be delusive, and the error may be accepted along with the truth. We may, by the criteria I have announced, get all the good without the accompanying evil; we may root out the weeds, that the flower and fruit-bearing plants may flourish the better. The tests clear away the mists that we may have a full view of the beauties of the sky and landscape.

It will be understood that what is offered in this lecture does not profess to be the whole of knowledge; it is only primary knowledge. A far greater number and variety of truths are reached in other ways than by intuition, while, however, they always presuppose it. Yet only the foundation-stones have been laid—I hope, as the Free Masons say, that "this foundation is well laid," that it is "a sure foundation." The mature tree is not yet before us; only a few seeds have been sown and some

roots planted, which are well "rooted and grounded." These primitive truths, like the granite rocks, go down deepest into the earth and mount the highest toward heaven. They bind and guarantee all other truths. They give us what no other powers can, which sense cannot give nor understanding give—eternal truths and eternal morality. They look as if they were the very footstool of God, before which we bow and put up our petitions for further instruction to him who sitteth upon the throne.

NOTE.—The above is a compend of Metaphysics or the Science of First Truths. The science is expounded fully in my work on "First and Fundamental Truths."

CHAPTER SECOND.

DISCURSIVE OR DEDUCTIVE TRUTH.

I.

WE have seen what are the truths with which every mind starts. We are now to view it as adding to the stock. It may do so in two ways. It may by its own power, or by a gathered observation of facts. In this lecture I am to treat of the first of these methods.

The process by which this end is accomplished is discursive or deductive; that is, we proceed from a truth given or allowed to something else implied in or deduced from it. It being granted that all men are mortal, we at once conclude that this man and that man and that we ourselves must die.

What is admitted is called the premise or premises. These may be got from one or other of two quarters: from intuition—that is, immediate inspection of things—or from induction, that is, from a gathered collection of facts. The first of these has been expounded in last lecture, the other will be unfolded in the lectures which follow.

We pre-suppose, then, that the mind has got

certain facts allowed it as premises. These may be intuitive or inductive; one or both. In looking at these we discover that certain truths are involved in them and may be legitimately drawn from them. In this chapter I am to unfold the process by which this end is accomplished, to determine the laws, their extent, and their limits.

The discursive process is usually described as consisting of three elements—the Notion, Judgment, and Reasoning. There is the notion, which, when expressed in language, is the term. There is judgment, which, when expressed, is the proposition. There is reasoning, which, when put in words, is the argument. By means of each of these we reach derivative truth, which may be rigidly tested.

Logic is the science which treats of discursive thought. I am not, in this little work, to give a system of logic. I use logic simply as furnishing the criteria by which deductive truth may be tried.

The grand regulating principle of all discursive thought is that what is drawn from the premise or premises must be in the premises. Being there, and being seen to be there, we draw it out. But we must take care that what we bring out is in what we have derived it from. This law, rigidly carried out, will preserve us from all inconclusive reasoning. We cannot draw light from cucumbers, be-

cause there is no light in the cucumber. But, it being allowed us that all men have a conscience, we infer that this liar, though he has not obeyed it, has a conscience. This general rule may be applied to every kind of deduction or discursive thought, and, taken along with other and more minute rules founded on it, decides for us whether we are proceeding on the laws of thought, which, being planted or developed in our nature by God, are always truthful and authoritative. Each of the two great processes will be found to have its own laws.

II.

THE NOTION OR TERM. First under this head is the Singular notion, such as the earth, the heavens, Homer, Shakespeare, George Washington, "sky, mountains, rivers, winds, lake, lightnings, yea, with clouds and thunders, and a soul to make them felt and feeling." The singulars are always concrete; that is, they contain an aggregate of qualities which we call attributes; thus, the earth has elementary bodies and is attracted to the sun. I call such notions Singular Concretes. Secondly, there is the Abstract notion; that is, notion of part of a whole, more specially of an attribute of an object. As examples I may give, leg of table; foot of a man; foot of a mountain; gravity, beauty, honesty, human-

ity. Thirdly, there is the General notion, the universal of the schoolmen, the concept of the German, such as stones, plants, animals, man, woman, angels. All these contain an indefinite number of objects; namely, all that possess the common qualities of the class.

Now we may derive truths from each of these classes. Thus from singular concrete truths we can draw abstracts; from this body before us we can get the abstraction gravity; from this man, manliness; from this woman, beauty; from Washington, patriotism. Again, from singulars we can form generals; by help of abstraction all can unite things by common attributes in them, and form the class, rose, lily, dog, horse, man, American.

Now it is of the utmost moment that we know the nature of the notions and terms we employ. In thinking, in reading, in speaking we should know what sorts of terms are used; whether they are singular or common, concrete or abstract. In employing concretes we should ascertain, more or less definitely, the properties possessed by them. It is a great mistake to look upon an attribute as having an independent existence; gravity, for instance, has an existence only in the bodies of which it is a quality. In thinking, in speaking of universals or classes we should have an idea, the clearer the

better, of the qualities which combine the objects.

Of all fallacies that of confusion is the most common and the most misleading, and of all fallacies of confusion that of notions or terms is the most injurious, being more so than those of judgment or reasoning. When an object or a cause is placed fairly before us we can commonly judge of it and reason about it correctly. But when it is put in imperfectly understood terms our thinking is apt to be perplexed and mistaken. I believe that more than one half of the errors of thinking arise from confusion in our Notions. The prejudices of the heart work on these, "the wish is father of the thought," and the issue is misapprehension and error, and, it may be, sin.

There has been an immense amount of controversy about abstract and general terms. It was the grand topic of discussion among the scholastics in the Middle Ages, and I am convinced that it is of vast moment to clear up the subject. It is still in a confused state. I feel no difficulty in comprehending the nature of the abstract and general notion. The question is, What reality is there in these notions? I think it can be answered clearly and satisfactorily. The abstract has no independent reality —its reality is in the things from which it is ab-

stracted; thus honesty has a reality in the honest man. The universal or class notion has a reality in the objects embraced in it and in the qualities combining them. The common notion, "vertebrate animal," has a reality in the animals and in the vertebrate column which they all possess.

III.

JUDGMENT; which, when expressed in language, is the Proposition. In this we compare two notions; or, rather, the two things embraced in the notions declaring their agreement or disagreement. In making the comparison we have to look to the nature of the notions and observe what is embraced in them. The comparison we make may be viewed under two aspects. "The bird sings." Here we have two terms. "The bird" and "sings," or, "is singing." The one of these is singular—"the bird;" the other is common—"is singing." In comprehension, that is, in regard to the qualities possessed by it, it means that it has "the attribute of singing;" in extension, that is, in regard to the objects in its class, it declares that the bird is "among singing creatures." These two are involved in each other; the one implies the other.

In forming these judgments we should attend carefully to the nature of the two things compared,

and, as we do so, we may draw a number of inferences. These have a place, and an important place, allotted to them in all advanced works on logic. They are called Immediate Inferences. I call them Implied Judgments. Thus by subalternation, that is, of things under classes, we infer that if all men be responsible the heathen are responsible. Under extension we say what is true of a class is true of each member of the class; for example, what is true of all roses is true of the rose before us. Under conversion we turn the subject into the predicate, and the predicate into the subject; thus, it being given that all poets are men of genius, it follows that some men of genius—not necessarily all men of genius—are poets. When we have contradictory propositions we are sure that when the one is true the other must be false.

The following inferences have been drawn in Thomson's *Outlines of the Laws of Thought* from the proposition men are responsible:

IN EXTENSION.

Every man is in the class responsible.
This man is responsible.
Some men are responsible.
Some responsible beings are men.
It is not true that no men are responsible.
It is not true that some men are not responsible, etc.

IN COMPREHENSION.

Man exists.
Responsibility is a real attribute.
Responsibility is an attribute of every man.
Responsibility is an attribute of this man.
Responsibility is an attribute of every tribe of men.
Responsibility is an attribute of some men.
Irresponsibility may be denied of all men.
No man is irresponsible.
Irresponsible beings are not men.
Men of wealth are responsible with their wealth.
To punish men is to punish responsible men, etc.

IV.

REASONING. This is the highest form of the discursive processes. Every human being is employing it. The infant, the child, is using it perpetually in drawing conclusions from what he observes; in determining, for instance, the distances of objects, which it has been shown he does not know instinctively. The very fool uses it, only, however, about insignificant objects, say, his animal wants, as when he argues that food will satisfy his hunger. The madman, commonly starting from mistaken premises, from a wrong idea and belief impressed upon his mind, often bursts forth into wonderful displays of it. The intellectual ability of a man (I do not say his genius) is shown in the extent and agility with which he reasons. There is reasoning,

in a lower or higher shape, in the every-day transactions of life, as when we avoid danger and seek to secure what will gratify us. It has a necessary place in all the sciences which combine in a system the objects which present themselves to us. Mathematics, beginning with definitions and axioms which are self-evident, consists in reasoning throughout, and this often of a very delicate and recondite nature, as in quaternions and functions.

Now it is surely of vast moment, since so much of mental activity is thus exercised, that we should have decisive tests to determine when we are reasoning correctly. Now we have had this ever since the days of Aristotle, who analyzed the reasoning processes for us in the fourth century before Christ. Attempts have been made once and again to set aside his account, but all of these, after a brief apparent success, are admitted to have been failures. This analytic sets before us all the forms which reasoning takes, and thus enables us to try every sort of pretended argument.

The whole of reasoning is founded on one simple law called the Dictum of Aristotle, which takes two forms. Put in the form of extension, that is, of the objects which the terms contain, it is, "Whatever is true of a class is true of all the members of a

class." It may also take the form of comprehension, that is, of the attributes of the class. "A part of a part of an attribute will be part of the whole attribute." Reasoning, when spread out, takes the form of a syllogism, in which we have two premises and a conclusion. First, we have two notions given us in the premises, and we cannot, on looking on them, say whether they do or do not agree. We are not told in Scripture whether John the Baptist was a priest, but we call in a third term, son of a priest, and we compare each of the other two with this third term. We know that the sons of priests were also priests, and we have the syllogism:

The sons of priests were priests;
The Baptist was the son of a priest;
Therefore he was a priest.

This type determines for us whether reasoning is valid. If it cannot be put in this form it is invalid.

This is the Categorical form. But, being guided by the same dictum, it may take a Hypothetical shape:

If this man has consumption
    He will soon die.
He has consumption.
    He will soon die.

Or some cases may be put conveniently in the form of a Disjunctive:

Lines are either straight or curved.
The line A B is not straight;
It must be curved.

Or it may be best exhibited in the form of a dilemma:

If a man can help a thing he should not fret about it.
If he cannot help a thing he should not fret about it.
But he can either help a thing or not help it.
In either case he should not fret about it.

In some cases we have a seriate or chained reasoning by a series of arguments.

I simply refer to these forms. I am not to spread out their details. This is done with care and accuracy in every Logical treatise of any value. They can all be reduced to the form of the syllogism which depends on the Dictum. These Logical forms supply us with tests clear and certain for every kind of reasoning, in science or in the business of life.

Logic has at times been exposed to ridicule because of its multiplied technical rules, which, it is alleged, rather perplex and confuse the mind, and lead it into sophistry. Thus the great English satirist describes Hudibras:

> He was in logic a great critic,
> Profoundedly skilled in analytic;
> He could distinguish and divide
> A hair twixt south and south-west side;
> On either which he would dispute,
> Confute, change hands, and still confute.

The pilot of a ship often needs to decide between narrower distinctions than that between west and north-west side, and if he neglects to do so his vessel may be wrecked. So every man, in his voyage through the troubled ocean of life, needs to make more delicate distinctions than the pilot or the geographer. Error will present itself in forms so like the truth that it is very apt to deceive us, and so we need rules which will accept the true and reject the false. This is the use of all those formulæ which Logic has drawn out with such care. It is intended, not to produce and foster wrangling, but to discourage and arrest it, and to show us the way by which certainty may be reached.

V.

We have now before us the operations of discursive thought, embracing the Notion, Judgment, and Reasoning. The scientific expression of these constitutes Logic. The science can determine for us whether the deductions drawn out by ourselves or

others are valid. Let us look for a little at the way in which Logic accomplishes this end by the laws which it lays down.

The formation of notions is governed by laws. These can be ascertained and enunciated. Deductions can be drawn from them.

From the singular concrete notions we can draw others. From an apple before us we can get the notion of its taste, its color, its weight, its odor. These are abstract notions. Again, from a number of apples we can collect them into a class and affirm of this object before us that it is an apple. Let us understand correctly what is the nature of these two notions, the abstract and the concrete. Take gravitation—some scientific men all but worship it. Let me tell them that gravitation has no existence save in the bodies which it draws toward each other. Newton, when he discovered the law, looked to the bodies in which it acts: to the apple falling to the ground, to the moon drawn toward the earth. So much for an abstraction; it exists as an attribute in the objects from which it is taken.

There is a class notion; there is not only this apple which we know by the senses, but there is the class apple; embracing all the apples which have ever existed, all the apples which ever shall exist, nay, all the apples which children have

longed for in their fancies, all the apples which poets or painters have drawn. The class has an existence, but not an independent one; it has an existence simply in the objects and in the qualities which combine them.

Now certain rules can be laid down as to these abstract and general notions. I. The abstract implies the concrete in which it exists. II. The general implies particular things of which, under the bond which connects them, it exists. It is asked, what sort of existence have abstract and general notions? You hear people say of certain notions that they are nonentities; they are mere abstractions. But all abstractions are not nonentities; The love of a mother is not a nonentity—it exists in the mother. Virtue, though an abstract term, is not a fiction, it exists in all virtuous men and women. You tell me that you know by the senses what an apple is, but as to the class apple it is a fiction. I ask, What makes you put all these apples into one class and to recognize an apple when you see it? You must answer that all these apples have certain common properties. This, then, is the reality in the class. The class vertebrate has a reality in the vertebrate column which they all possess. III. When the object is real the abstract is also a reality in the thing; when the

things generalized are real the concept which binds them is also real.

VI.

In the proposition we must carefully consider how the two terms stand toward each other. We must particularly inquire what is their extension and what their comprehension. In subalternation we must see that the species are included in the genus. In conversion the rule is that the term be not more extensive in the conclusion than in the premise.

VII.

In Reasoning Logic teaches us to look to our terms. It insists that there be three and only three terms: two extremes and a middle which unites them. It shows us that they can be put in the form of a syllogism if the reasoning is valid. If they cannot it is a proof that the reasoning is not valid.

In all these ways Logic gives us decisive tests to show us when our conclusions follow from the premises.

It has so often been explained that it scarcely needs to be repeated, that Logic does not give us the capacity of reasoning. It proceeds on the idea that we reason naturally by the powers which God has given us. It shows us what are the exact proc-

esses involved and thence formulates rules to guide us to truth and save us from error.

Logic has been called the Grammar of Thought. Logic is not the same as Grammar, but it is analogous to it. Grammar does not profess to teach us how to speak or write, but it explains the laws involved and teaches how to speak and write correctly. So Logic does not claim to give us the power of thinking, but it shows us how to think accurately, and to correct false reasoning.

Grammar does not make any man an orator. Neither does Logic make man a powerful reasoner. But grammar will give every man of ordinary intelligence the power of speaking accurately. Logic will not enable every man to reason so consecutively as Aristotle or the Apostle Paul or Bishop Butler, but it will teach every man of common understanding to reason clearly and conclusively, and thus help him to convince his audience. It is not needful that the orator should construe his sentences as he utters them; but it may be evident all the while that we have the result of a grammatical training in these well-constructed sentences. So it is not necessary that the pleader should put his argument in syllogistic form, but it may be seen at every step that he is giving us the result of a thorough logical training.

NOTE.—The above is a compend of Formal Logic which is expounded fully in my "Laws of Discursive Thought."

CHAPTER THIRD.

INDUCTIVE TRUTHS.

I.

Scattered Facts.

AN eminent man is reported as saying that there are more false facts than false theories. There is truth in this. Facts are apt to have adjuncts to them in the reports given by others, and even in our own apprehensions of them, or they are so mutilated that they take an entirely distorted form. We all know how, in story-telling, additions and subtractions are apt to be made even by honest narrators, so as to make it more attractive and picturesque.

The individual facts are primarily made known by the senses. In these there may be very numerous and complicated details, and any of these if left out may so far distort our apprehensions and the account we give of them. Besides, sensations, feelings, fancies, inferences, attachments, and repugnances may mingle with our pure perception of sense and cast a glow or a gloom around them. In these sections I am showing that we have to guard

against these temptations, and that when we do so we can arrive at positive truth.

Observation Proper and Experiment.—These are the two ways in which we obtain facts. In the former we view objects simply as they present themselves; in the latter we put them in new positions. The advantage of Experiment over Observation Proper (which may be so designated as Experiment is, after all, a kind of Observation) is that it enables us to perceive the proper action of the several agencies joined in nature. We wish to know whether bodies, whatever be their weight, fall to the ground in equal times. Common observation seems to show that they do not, as we see the gold nugget and the leaf falling at very different times. But we put the gold and the leaf into the exhausted receiver of an air-pump and find them fall the same instant. What we should do in all observation is to note precisely what has occurred, and to report it accurately—without any additions, subtractions, or coloring; we must be especially on our guard against torturing the facts in order to make them give a certain kind of testimony.

THE SENSES.—The older Greek philosophers adopted the common opinion that the senses deceive. The skeptics took advantage of the doctrine and argued that if the senses deceive there is

nothing we can trust in. The sounder philosophers met them by calling in reason, which corrected the illusions of the senses and conducted to truth. Aristotle corrected both these forms of error, and showed that the supposed deception arises, not from the senses themselves, but from the use that is made of their intimations.

To save the senses it is necessary to draw certain distinctions. In particular we should distinguish between our original and acquired perceptions. The former are intuitive, without any process of inference, having the sanction of the author of our constitution, and never deceiving us. The latter imply inferences from the revelations of sense perception, and there may be errors in them.

I believe we can approximately determine what are the original perceptions of the various senses. By several of the senses we seem to perceive merely the bodily organs as affected. This is the case with taste and with smell, in which we discern simply the palate and the nostrils with a certain sensitive expression of the palate and the nostrils. It is the same also, I believe, with hearing and with touch proper, or feeling, in which we know simply an affection of the ear and the periphery of the body. I rather think that by the muscular senses and the eye we discern more: a body resisting our organ-

ism and a colored surface affecting us. In all these intuitive perceptions there is no ratiocination, and there are and can be no mistakes. But in all beyond there are inferences, and in these there may be less or more of error. A person tells us that he had mutton to dinner, whereas all he knew was that there was a certain taste in his mouth which he argued was that of mutton. He further lets us know that he felt the smell of roses in a certain garden, where he also heard a flute playing, whereas immediately he felt only an odor in his nostrils and a sound in his ear. He is sure that he was struck in the dark with a man's hand, whereas the blow was from a stick. He depones that he saw a man strike his wife, while all he saw was an action of one figure upon another, and it turns out that the woman was not the man's wife. Hence arise some of the mistakes in witness-bearing; they are not lies of the senses, but errors in the inferences we draw from them.

In all such cases we form a general rule out of certain experiences, and in hasty thinking we illegitimately apply it. We regard sound as coming to our ear in a straight line from the sounding body, but the undulations have been reflected from a wall; and we place the bell from which they have come in that wall, whereas the belfry is actually in a dif-

ferent direction. It is on this principle that the ventriloquist proceeds when he makes a human voice come from a post or an animal. Having laid down the rule that when there are few observable things between us and an object it must be near, we look on that island seen across the sea as much closer to us than it is.

Some other distinctions must be attended to. Sensations and feelings of pleasure and pain, of beauty and ugliness, associate themselves with all our perceptions, and are apt to give a color and even a shape to the actual things. We remember more particulars about the objects that excite us, whether joyously or grievously, than those that are dull and commonplace; and we give these a large, often an undue, place in our narrative, and thus distort them and give them a different meaning.

The rapid inferences from the intimations of the senses may at times serve a good purpose. They may prepare us to meet and avoid danger when cool and correct argument would not be quick enough. A fire-bell, the jolt of a carriage in which we are riding, a stumble in walking, the fog-whistle at sea may at times raise up an unnecessary alarm, but the calm reflection which succeeds will soon dissipate this, and at other times they save us from danger.

We have abundant means of correcting the hasty judgments. We have other senses at hand to correct the apparent deceptions of one sense. We imagine the figures raised optically by magicians to be real, but we can dissipate the illusion by thrusting our hand into the specter. We may mistake beef for mutton as we eat it, but it is easy to apply to the person who prepared the food to set us right. A diseased eye may present objects double, but the touch will correct the mistake. In all cases we can secure that what is told us by the senses is true by judiciously using the means of correction at our disposal.

SELF-CONSCIOUSNESS. — Metaphysicians commonly maintain that the revelations of consciousness are always to be trusted; that they settle every thing in the last resort, and are, in fact, ultimate and infallible. But there are physiologists, and, of a later date, even metaphysicians, who assert that the acts of consciousness are variable and often deceitful. They show us that people often misapprehend what their real feelings are, and give a wrong account of them. It is alleged that there are persons who say that they believe certain tenets when they do not, only imagining that they do. There are cases of persons with a "double consciousness," as it is called; remembering, in the one

state, the experience of that state, but without any remembrance of it in the other.

But in all such cases we attribute to consciousness what it is not responsible for. In regard to the inner, as in regard to external, sense, we have to draw distinctions if we would determine their precise testimony. It is acknowledged by all psychologists that, properly speaking, we are conscious of self only in its present state. In that state there are various affections: there are sensations and feelings and inferences along with the pure consciousness, and we are apt to mix them up with each other, and thereby breed confusion in our apprehensions and in the account we give of what is in our mind. When we review our consciousness we are dependent on our memory, and we may omit some aspects of our experience and add associated affections. Here, as in regard to the bodily senses, distance is apt to lend enchantment to the view. The hypochondriac magnifies his sorrows, and the gay youth his pleasures in the past. People are apt to think their youth was happier than it really was; they remember their joys and forget their little disappointments, which were then felt to be so great and now appear so little.

What is so called is not really "double consciousness." It arises from a diseased state of the brain

hindering physical action. The person is unable to recall what has been laid up in the past, and he lives in the present and lays up a new experience, which he uses in his new state, but which he may lose in a later condition of his brain. The man is not under a double consciousness, but in two states, in each of which the consciousness may be correct.

It thus appears that man may trust in what his consciousness really reveals. It makes known to us self in its present state. It should be noticed that it does not know merely a quality of self, such as thinking or feeling; it knows self as thinking or feeling. This is of the nature of a first truth or an intuition; we perceive the very thing. This self constitutes what we call personality; that is, we know ourselves as persons. On comparing the self as presently known with the past self as then known we declare ourselves to be the same. This is personal identity; which is a self-evident, necessary, and universal truth.

MEMORY.—The vulgar opinion is that the memory may deceive. But it does so only as the senses deceive. The mistakes are not in the memory proper, but in the associated affections and the inferences drawn from them. We ask a man how long it is since he visited us. His recollection is dim, and he makes the time longer than it is—six

years instead of five. It is not possible for him to remember his continued existence during these years, any more than it is possible for the eye to see every point in space between us and objects five or six miles off. In both cases he has to avail himself of intervening objects. The event, he remembers, took place after his marriage, seven years ago, for his wife was with him; and before his mother's death, four years ago, for he remembers we made inquiries about her health. But he does not recollect at what precise date between these two occurrences the visit was paid. The reminiscence was dim, and he concludes that the event is more distant than it really is. Our memories in regard to time all need such mile-stones, or rather time-marks, to enable us to measure the distances. Now, in all these processes there may be mistakes. It is much the same with our recollections of the other circumstances connected with events, such as the shape and color of objects, their position in relation to other things, their surroundings, their antecedents and consequents. The vision is obscure and we have to fill it up, and we do so by fancies of our own, which so far modify the scene, perhaps pervert it. We are apt to join causes and consequences with the bare occurrences. This is especially apt to be the case with conversations, with the sentences

uttered by ourselves or by others. We recollect how we felt, what we meant to say, what effect was produced on us by what others said, and we confound these with what was actually uttered. Hence the misunderstandings, the perversions which are so apt to appear in the reports of conversations. In the complicated scenes through which we have to pass we remember those parts that have been most vivid—these, I suppose, have impressed themselves most deeply on our organism, and the others are feebler. The consequence is that the record has faded in some places, and we make additions in order to complete it. In this way we clothe our bare memories with dresses which may make them look sadder or more joyful than the events really were at the time.

But it is always possible to distinguish between our original and proper recollection and our superadded and fictitious ones. Those who are conscientious will be careful not to add out of their own stores to their memories. When the reminiscence is dim they will at once confess it, especially in witness-bearing, and when the character of a fellowman may be affected. In all scenes which we wish to remember accurately we will take care to note the exact incidents at the time they occur. There are events of which we are certain that they have

happened. I might have treated of testimony here as it gives us facts to be put under law, but as the subject is to be fully treated in Chapter Fifth I refer it to that place.

II.

INDUCTION.

This consists essentially in gathering facts in order to ascertain the order that they follow, which will be found to consist in laws which they obey. It was known to Aristotle that the mind starts with the singular (*τὸ ἑκάστον*) before it rises to the universal (*τὸ καθόλον*), which, as he expresses it, may be first in the order of nature, while the singulars are first in the order of time. He practiced the method in his natural history, very specially by the collections which were supplied by his pupil, Alexander the Great. But he cannot be said to have systematically expounded induction as a method of discovering truth. This was reserved for Francis Bacon, who enjoined that in observational science the mind should begin with particulars, which are to be collected and collated, and then rise to minor, middle, and major axioms, and thence finally to causes and forms. All this was to be done not *per saltum*, but by gradual steps. The method has since been made more definite by Sir John Herschel, in his

Natural Philosophy; by Dr. Whewell, in his various works on *The Philosophy of the Inductive Sciences;* specially by John S. Mill, in his *Logic*, and by others. The method will become more perfected as science advances with its observations and experiments, with its instruments and its critical examinations. That method has a Means and an End. The Means are observation with analysis. The End is the discovery of laws.

III.

Analysis and Synthesis.—By the former we separate a concrete or complex object into its parts. In chemistry there is an actual separation of one element from another; say the oxygen from the hydrogen with which it is combined in water. But in most investigations the separation is in thought. Thus in all bodies we find both extension and energy, which cannot be separated in fact. Thus logicians analyze discursive thought into simple apprehension, judgment, and reasoning, or in the expression of these into the term, the proposition and argument. The process is performed by abstraction, in which we contemplate in thought a part of a whole presenting itself, more particularly an attribute of an object, say gravitation. In analysis we separate the whole into its several parts. Ab-

straction can be performed on every object, as every object has more than one quality, and we can fix on any one of these. Analysis can be performed only when we have such an acquaintance with an object as to know all its parts.

The exercise of abstraction, and, when it is available, of analysis, is required in every kind of investigation. Bacon speaks of induction commencing with "the necessary rejections and exclusions," that is, the separating of the matter to be investigated from the extraneous objects with which it may be associated in nature. Whately says (*Logic*) that in teaching a science the analytical mode is the more interesting, easy, and natural kind of introduction, as being the form in which the first invention or discovery of any kind of system must originally have taken place. Whewell gives an apt name to the procedure, which he recommends as the " Decomposition of Facts." It serves not only to separate objects from others, but to break them down, so that we may obtain a better acquaintance with them—with their internal structure and their several qualities. It is a process to be employed throughout in all investigations of nature, which in every department is full of complexities.

Analysis can scarcely be described as discovering truth. It is rather a means or instrument toward

this end. At the same time it should be noticed that when we abstract a part, say a quality, from an object, the part, the quality, has a reality as well as the whole. If the concrete be real the abstract is also real. The abstract may not have an independent reality; thus gravitation has no reality except in body, but it has a reality in body. The criterion here is that the part be really a part of the actual whole; that the quality be a real attribute of a real thing.

Analysis is a sharp, and may become a dangerous, instrument. It may be over subtle, and dissect and kill what should be kept alive and entire. It is fulfilling its end only when, to use an illustration of Plato's, it is dividing the carcass as the butcher does, according to the joints. Among the ancient Greek philosophers the analytic was the method commonly employed. Down to this last age the analytic and the synthetic were represented as methods of discovering truth, and had large fields allotted to them. Kant's great work, the *Critique of Pure Reason*, is divided into the analytic and synthetic parts.

In synthesis the parts are put together to show that they make up the whole. Thus Whately decomposes discursive thought into the term proposition and argument, and then shows synthetically

that these make up the whole process. Sir John Herschel, in his *Astronomy*, begins with taking up the several departments of the heavens, and then expounds the whole science. The two, analysis and synthesis, must continue to be used as instruments, but they now do so in the methods of induction and deduction.

IV.

Criteria of Laws.

Hitherto we have had to do with individual facts, which tell us nothing beyond themselves. We have not as yet any means of anticipating the future from the past, or gathering wisdom from experience. In particular we have no science; which consists, not of scattered and isolated facts, but of systematized knowledge. In the construction of science we must co-ordinate the facts. In doing so we discover the laws, and find that all mundane affairs are regulated by laws.

But the question arises, How do we, from individual facts, reach a law? Or, more specifically for our present purpose, When are we entitled to conclude and be satisfied that we have found a law which may be regarded as general or universal? The answer of those who have not thought specially on the subject would be, When we have observed

all the facts. But a moment's reflection shows that in most cases, I believe in all, we cannot find out all the facts. We assert that crows are black, but we cannot go the round of the world and ascertain that it is so. We may have examined millions of cases and found all crows black, but how do we know that a traveler may not report that he has found a white crow in some distant island? In science we say that all mammals are warm-blooded, or that all matter attracts other matter inversely according to the square of the distance; but no one has searched the universe and noticed every mammal and every particle of matter so as to be able to say that no mammal is cold-blooded, and no particle of matter without the power of attraction. But from a limited number of observations we can rise to a law which seems to be universal. How is it so? Mr. Mill maintains that he who can answer this question is wiser than the ancients.

Bacon describes the method of observation by "perfect innumeration" of cases as puerile, and incapable of yielding any fruitful results. In induction we have to rise from the unknown to the known. We argue from a limited number of cases in the past to a universal law which we hold to be true in the future; not only so, but in all unknown cases, past and present. The father of inductive

philosophy was aware of the difficulty of the problem, and he sought to solve it by bringing in Prerogative Instances (*Prerogativæ Instantiarum*) which could determine what is true of all instances. To give only one example, that of *Instantia Crucis*, the metaphor being taken from the notice put up where two roads meet to tell which to take. It was disputed whether light consists of material particles or of vibrations in an ether. To settle this it was maintained by Fresnel that instances can be artificially produced which are inconsistent with the material, but not with the undulatory theory. But we have now better tests in the Canons of Induction.

When man looks abroad on nature in a loose way he sees a number of scattered facts. At first sight it looks as if they have two characteristics; they have both irregularity and they have regularity. He soon begins to seek for order in the midst of the seeming disorder. He is impelled to this by his intellectual powers, which prompt him to seek for the nature and relation of things. But he is specially led into this inquiry by finding that he cannot make good and profitable use of nature till he knows how it acts. He will not sow grain at one season unless he knows that he will reap for his sustenance at another season. In prosecuting such inquiries he discovers that order prevails in the midst of apparent

confusion. He calls the regular proceedings by the name of laws, believing that they are the expression of the will of a law-giver. "They continue this day according to thine ordinances, for all are thy servants." But it is not enough that he knows that there are laws. In order to take advantage of them he needs to ascertain their precise nature. He would determine the number of days in the year, the periods of the returns of the seasons and of the the moon. While he is seeking after these regularities he finds that there is a deeper and higher law in nature; there is not only a law of order, there is a law of power. Prompted by an internal intuition, confirmed by a uniform and unvarying experience, he concludes, that every event in nature has a cause, not only in God, who works in all the agents in nature, but in some power in nature.

The object of all science is to discover order, or, in other words, laws. But there is great confusion in the statement that all things are governed by laws. This will not be cleared up till we distinguish between two kinds of laws:—the Laws of Uniformity and the Law of Causation.

V.

I. Laws of Uniformity.

There is an order in nature, in other words, laws in nature which we can observe and profit by with-

out at all looking to the causes, though we shall see that they have causes. They will best be understood by some examples. There is the succession of day and night. Day does not cause night nor night cause day. Yet they follow each other invariably. It is the same with the seasons—spring, summer, autumn, and winter—no one of which produces its successor, though it prepares for it. There is the life of the plant—the seed, the blade, the flower, the fruit. There is the growth of the animal—the germ, the birth, infancy, mature life, decay, old age. There are periodical occurrences—the trade-winds, the gulf-stream, the evening sea-breezes. There are the epochs in geology—the Azoic, the Eozoic, the Silurian, the Devonian, the Carboniferous, the Mezozoic, the Cenozoic, the Quaternary, the Human. There are the eras in history—as, in Jewish history:—the Antediluvian Period, the Patriarchal, the Exodus, Government by Judges, Government by Kings, the Captivity, the Coming of Christ, the Dispersion of the Jews.

But there is a deeper principle involved.

VI.

II. The Law of Cause and Effect.

I believe this to be an intuitive principle, standing the tests above enunciated. I believe that

when we discover any thing beginning to be we look for an antecedent producing it—a substance with power. But without entering at this place on this disputed metaphysical subject, I may take it for granted that the principle of causation is sanctioned by a universal experience, and will not be denied by any one. Many, indeed, feel that the principle may require to be enunciated anew and put in a better form since the discovery of the law of the Conservation of Energy, or the Persistence of Force, as Herbert Spencer calls it. But whatever be the best shape in which to put it, we assume in all induction that causes produce their proper effect, and that every new product or change in an old thing has a cause. One of the aims of inductive science is to discover what has caused a given phenomenon; what has produced it in the past and will produce it again. The principle of causation might have reigned in all nature and yet there have been no uniformity. All action in nature might have as its sole cause the fiat of God. The connection of all things would, in this case, be with God, but not with one another. The spring, with its buds and blossoms, would be produced by God, but this would give no security that the fruits of autumn were to follow. Or, again, there might be constant interferences by God with the operation of

natural agents; or causal agents might work, and yet there be no such thing as the general laws, such as the seasons, which we observe and trust in. We find, instead, that the agents of nature are so disposed or arranged that they produce uniformities, not the result of any one cause, but of a combination and harmony of causes; such as the periodicity of the heavenly bodies, the flow of the tides, the regular return of the seasons, the plant rising from a seed and producing a seed, and the descent of the animal from a parent, its growth and its death. All these imply causation, but they require more—an adjusted causation.

But it is necessary to settle more definitely what is implied in the uniformity of nature which lies at the basis of all induction. It implies, first, that there is a certain number of agents acting in nature; it is not necessary for us to settle how many. Secondly, that these are so collocated or arranged—I believe, adjusted—as to produce general results, called laws, which we observe and act upon and can scientifically express. Thirdly, these agents constitute nature, and there is no introduction of new agents and no interference with them in ordinary circumstances. This statement does not preclude miracles on rare occasions; these miracles not being contrary to the law of causation, for they have the

power of God as a cause, but they are simply an exception to the uniformities of nature. These two classes differ from each other, yet they are closely connected. The laws of uniformity proceed from the law of causality. It is the disposition of the sun and earth that produces day and night and the seasons. There are causes within and without the plant and animal which produce development. The sea and land breezes have been produced by meteorological agencies.

CANONS OF INDUCTION.—There seem to be three grand ends which men of science have in view in their investigations: One is to discover the composition of the objects around us; the second is to discover natural classes; the third is to discover causes.

Canons of Decomposition.—Almost all the objects we meet with in the world, whether material or mental, are composite. It is the aim of many departments of science, in particular of chemistry and psychology, to analyze them. This can, so far, be effectively done. There are certain rules to guide us, and these may be made more and more specific as the analytic sciences advance.

A. We must separate the object we wish to decompose from all other objects. If we wish to analyze water we must have pure water, separate from

all other ingredients. If we wish to analyze intuition or reasoning, we must separate it from all associated observations and fancies.

B. When we have found the composition of any piece or portion of a substance we have determined the composition of every other part, and, indeed, of the whole. When we have ascertained that a pint of water is formed of hydrogen and oxygen we have settled that water every-where is composed of the same elements. This arises from the circumstance that every substance in nature has its properties, which it retains. Having detected these properties in one case, we have found what they are in all.

C. The elements reached are to be regarded as being so only provisionally. We are not sure that in any cases we have found the ultimate elements of bodies. At present it is supposed that there are some seventy elements, but we are not sure of any one of these that it will never be resolved into simpler substances. Meanwhile the chemical analysis is correct so far as it goes. It will always hold true that water is composed of oxygen and hydrogen, though it is possible that oxygen or hydrogen, one or both, may be resolved into something simpler.

Canons of Natural Classes.—There are certain

sciences which are called by Whewell Classificatory. They are such as botany, zoology, and mineralogy. We may have two ends in view in classifying. One may be simply to aid the memory by having the innumerable objects of nature put into a convenient number of groups. For this purpose we fix on certain obvious and convenient characteristics and put all the objects possessing them into one class. It was thus that Linnæus put under one head all plants possessing the same number of stamens and pistils. This arrangement, though it does not come up to the requisitions of a perfect classification, is found to be very convenient. Second, our object may be to increase our knowledge by so arranging objects that one characteristic may be a sign of others. In natural classification we should always aim at securing both these ends. There are canons which may assist us in determining when we have reached natural classes.

A. We must have observed the resemblance in many and varied cases, say in different countries and at different times.

B. We must be in a position to say that if there had been exceptions we must have met them. These two rules guard against forming a law from a limited class of facts.

C. There are classes in nature called Kinds, in

which the possession of one quality is a mark of a number of others. All classes entitled to be called natural are more or less of this description. Thus mammals are so designated because they suckle their young; but this characteristic is a mark of a number of others—that the animals are warm-blooded, and have four compartments in their hearts. Reptiles are recognized as producing their young by eggs, but they are also marked as having three compartments in their hearts and being cold-blooded.

Canons of Causes.—The most lucid and, upon the whole, the clearest and most satisfactory exposition of these methods is by Mr. John Stuart Mill in his *Logic*. It should be noticed that his methods relate to causes, and we have not had from him an exposition of the canons of decomposition and classes as given above. He mentions four or five methods.

A. The Method of Agreement.—In the spring season we see innumerable buds, leaves, and blossoms appearing upon the plants, and we find the common cause to be the heat of the sun shining more directly upon the earth. The canon is, "If two or more effects have only one antecedent in common that antecedent is the cause, or, at least, part of the cause." That canon is too loose to

admit of a universal application, as we may not be sure that the point of agreement we have fixed on is the only one. Two people take the same disease at the same time; we conclude that the cause is the same—but it may have been different.

B. The Method of Difference.—In the very middle of the day I find the scene around me on the earth suddenly darkened. There must be a cause. I find that the moon has come between us and the sun, and this seems the only difference between the two states—the one in which every thing was bright and the other in which it is in gloom. The canon is, "If in comparing one case in which the effect takes place and another in which it does not take place we find the latter to have every antecedent in common with the former except one, that one circumstance is the cause of the former, or, at least, part of the cause." This method is the one employed in cases in which experiment, with its separating power, is available. It is the most decisive of all tests when the circumstances admit of its application. This canon regulates many cases in common life. I am usually in good health, but I took rich food yesterday and was unwell, the cause being evidently the food. A man in health receives a gunshot wound and dies. We see at once that the wound was the cause of the death. There are cases

in which this method is not applicable when an intermediate one is available.

C. The Indirect Method of Difference, or the Joint Method of Agreement and Difference.—The canon is, "If two or more cases in which the phenomenon occurs have only one antecedent in common, while two or more instances in which it does not occur have nothing in common but the absence of that antecedent, the circumstance in which alone the two sets of cases differ is the cause, or part of the cause, of the phenomenon." The illustration given by Mr. Mill is: "All animals which have a well-developed respiratory system, and therefore aerate the blood, perfectly agree in being warm-blooded, while those whose respiratory system is imperfect do not maintain a temperature much exceeding that of the surrounding medium; we may argue from the twofold experience that the change which takes place in the blood by respiration is the cause of animal heat." There are two countries in much the same condition physically, in the one of which there are Christian agencies, and in the other none; in the former there is much higher refinement and civilization than in the latter, and the cause is evidently the Christian religion.

D. The Method of Concomitant Variations.—We want to know the cause of the rise of water in a

pump or of mercury in a barometer. The ancients accounted for this by nature's horror of a vacuum, which is inconsistent with the fact that water will not rise above a certain number of feet in the pump. Torricelli and Pascal gave a better explanation when they referred the rising of the water or mercury to the weight of the incumbent atmosphere, which Pascal proved by ascending a mountain with a barometer and finding that, as he rose higher and higher, the mercury fell lower and lower in the tube. Here we have the effect varying with its alleged cause, which is an evidence that the alleged cause is a true one. The canon is, "Whenever an effect varies according as its alleged cause varies, that alleged cause may be regarded as the true cause, or, at least, as proceeding from the true cause." In a certain town there is an increase of crime; at the same time there has been an increase of drunkenness, and we at once refer the increase of crime to the increase of drunkenness. In the far West the manners of the first settlers, being commonly young men, are apt to be rough; but they seek out refined ladies for their wives and their manners become refined. In the same region there are at first few churches and schools; these are gradually introduced and there is an improvement in the morals of the people.

E. The Method of Residues.—A farmer knows how much grain a particular field has yielded in the past. He mixes fertilizers with the earth on the field and finds he has a larger crop, and he ascribes the increase to the fertilizers. He knows what the previously existing antecedents will produce, and, after subtracting this, he ascribes the residue to the new antecedent. The canon is, "Subtract from an effect whatever is known to proceed from certain antecedents, and the residue must be the effect of the remaining antecedents." We know what are the orbits in which the planets move, but the planet Uranus was found by Leverrier and Adams to depart so far from the laws. There was a residue which could not be accounted for, and so they looked out for and found a new planet. We may proceed on the same principle to argue the existence of a conscience. We have a sense of merit and demerit; we find that this cannot be given by the senses or intellect, and to explain the phenomenon we call in a moral power.

VIII.

PSYCHOLOGY.

Here, as well as in all the physical sciences, we have to begin with the observation of facts. There is, however, an important difference between the

two departments. The facts in physical sciences are obtained by the senses; whereas in mental science the observing agent is self-consciousness. It is only thus we can find out what any physical act is. An examination of the nerves and brain may show how a mental state arises, but can give no idea of the mental act itself, say of a sensation, a recollection, an imagination, of moral approbation, of emotion or wish. In making consciousness our witness we have to allot to it a large province. We must include in it not only immediate introspection, but also the observation of the mental acts of others, as disclosed in their words, their writings, and their deeds. We cannot, indeed, look directly into the bosoms of our fellowmen so as to ascertain what is passing within, but we can gather what this is by the expression of it, which, be it observed, we can understand because we are conscious of our own acts. History, biography, travels, plays, novels, newspapers, and especially conversation and familiar letters, may all show us human nature quite as much as they do external incidents. Without these supplements we should have a very contracted view of the mind by inspection of our own souls.

The individual facts are made known in this way. The criterion of consciousness is in itself; it

is self-evidencing. As we observe the facts we distinguish between those that differ and co-ordinate them into laws. The criteria of the laws are much the same as those of physical science.

Psychology proceeds on the same two fundamental principles as physics. It is seeking for causes. Without determining the question of the freedom of the will we may confidently affirm that causation, that the persistence of force, rules in the mind as it does in the body. Certain antecedents are sure to be followed by certain consequences. The orator urges the considerations which may persuade those whom he is addressing and lead them to action. The poet raises up images that please and elevate the mind. The father and the teacher inculcate principles which may guide the young in all their future lives. Investigators in this department have been seeking to discover faculties and the rule and mode of their operation. The early Greeks found sensation, the discursive power, and reason. Aristotle had in the soul the nutritive power, sensation, memory, phantasy, and, above these, the reason, active and passive. In all ages there has been a grand distinction drawn, in a loose form, between the intellect and the will, the cognitive and the motive powers. Every body talks of the memory, the judgment, of reasoning, and of

sentiment and feeling, of the power of abstracting, generalizing, distinguishing, of loving, and of hating.

There seem, also, to be laws of uniformity in human nature. It does not appear that in the association of ideas one idea is the cause of that which succeeds; that when height suggests hollow and the dwarf suggests the giant, and prosperity adversity, and a portrait the original, that when we count up from one to one hundred, there is a causal connection between the ideas—they are the joint effect of a number of causes. In the science of psychology we seek to discover these laws, such as the law of habit, the connection between the idea and the feeling raised by it, the kind of acts which conscience approves of.

Now, there may be criteria of these laws, both of causation and uniformity. These have not been so carefully enunciated as those of physical science. I believe that, *mutatis mutandis*, they may be considered as very much the same.

The Method of Agreement.—Washington is named and we find the mind following a certain train. We think of his education, his training, the Revolution, his battles, his character, all of which have been previously in the mind together, and we reach the law of contiguity: that when ideas have been in the

mind at the same time, when one comes up the others are apt to follow.

The Method of Difference.—We see a portrait of Washington for the first time. The two, the portrait and Washington, were never before in the mind together, yet the portrait calls up Washington, and the law is, things that are related, especially things that are like, recall each other.

The Joint Method of Agreement and Difference.—There are days in which we find we can easily recall the things we would remember, other days in which they will not come up. The difference is in the time: that in the first few days our brain was in perfect health; in the other it is distracted.

Method of Concomitant Variations.—When we are interested in an event known to us we are apt to think of it more frequently, and we conclude that feeling, as a secondary law, influences our associations, and, according to the feeling with which it is accompanied, so do ideas come up.

Method of Residues.—On contemplating kind actions we feel a pleasure which can be explained by our social feelings; but we find that on contemplating some of these we have a feeling of moral approbation. This cannot be explained by the mere social feeling, and we have to call in a moral principle.

IX.

Reasoning in Induction.

The question is started, Is there reasoning in induction? I am sure that there is. From what has been ascertained by observation taken in a wide sense we infer something else—that there is a law which enables us to predict results.

How is it that the countryman is enabled to predict a coming storm? His father has told him, or he himself has observed, that when the wind is in the East, and the clouds are thick and black, there will probably be rain or wind. Here there is evidently inference which can be stated syllogistically by the logician, the general observation being the major premise, the particular state of the wind and sky the minor, and the conclusion that there will be a storm. Every class of men, in fact all men, do thus reason on premises implied, though possibly not expressed. The laborer argues, in his own way, that there should be a rise of wages; the merchant purchases because he concludes there will be a demand for his goods. Before there were any precise rules laid down on the subject scientific men drew true and important conclusions from common-sense principles in their own mind. The canons of induction now expressed definitely enable

us to put the reasoning in a more systematic form, which is a great advantage. We can now use the canons of induction (which, I believe, will become more definite and better expressed) as our majors in the syllogism of induction.

Major. When two or more effects have only one antecedent in common, that antecedent is the cause.

Minor. But the budding of innumerable plants in spring has only one common antecedent—the return of the sun to a higher altitude.

Conclusion, this one antecedent *is* the cause.

This is the method of agreement. Let us take a case from method of concomitant variations.

Major. Where an effect varies with its supposed cause this is the true cause.

Minor. But the rising and falling of the mercury in the thermometer varies with the less or greater weight of the superincumbent atmosphere.

Conclusion, the weight of the atmosphere is therefore the cause of the rise or fall of the barometer.

It should be observed that the canons, with their implied reasoning, do not guarantee to us absolute certainty, what is called apodictic truth or demonstration. None of these are certified, as first truths are, by the law of necessity; we can easily conceive any one of the ordinary physical laws not to be true universally, and we might believe so,

provided we had evidence. The evidence, after all, is merely a probability of a lower or higher degree, but may rise to a certainty only a little short of being absolute, and quite sufficient to justify us to put trust in it and act upon it in ordinary, indeed in all, circumstances. Such, for instance, is the proof which we have in favor of the law of gravitation. It is not demonstrative, like a mathematical truth, but it satisfies the mind and is verified by constant observation.

NOTE.—The above, with the chapter that follows, is a compend of Inductive Logic, which is well expounded in the Book on Induction in Mill's Logic. I believe I have done good service by drawing the distinction so definitely between the Law of Causation and the Law of the Uniformity of Nature (pp. 60-64). These two are commonly represented as one and the same. Though connected they are different in themselves and in their manifestations and ends. The first, causation, is simple, it is the law of force producing effects. The other is a complex product, the result of a co-ordination of forces and is an effect or result rather than a cause. A miracle is an exception to the uniformity of nature, but not to causation, for it has a cause in God.

CHAPTER FOURTH.

THE JOINT DOGMATIC AND DEDUCTIVE METHOD. THE JOINT INDUCTIVE AND DEDUCTIVE. HYPOTHESES AND VERIFICATION. CHANCE. INDUCTION CANNOT GIVE ABSOLUTE TRUTH. WE KNOW IN PART.

I HAVE explained the three ways by which we investigate truth; the Intuitive, the Deductive, and the Inductive. I am now to join these three and explain the methods which ensue.

I.

THE JOINT DOGMATIC AND DEDUCTIVE METHOD.

In this method we assume a principle and draw an inference from it. The principle may be a self-evident one, or it may be obtained from a gathered experience. The best example is found in geometry, where, at the opening, there are laid down definitions of such things as triangles, circles, squares, and also axioms or self-evident truths; and from these, and as involved in them, we get further truths by deductive reasoning. We have also examples in Formal Logic, as when the dictum of Aristotle is assumed, that whatever is true of a class is true

of the members of the class, and from this get the modes and figures of reasoning and innumerable inferences. The truths thus drawn are called appodictic by Aristotle, and demonstrative by the moderns. Or the assumed principle may be obtained from a collected induction, such as the law of light that the angle of reflection is equal to the angle of incidence, from which may be drawn a large body of conclusions.

This method has often been applied illegitimately, that is, to departments which have to deal with scattered facts. In the seventeenth century, when mathematics made such a start, there were attempts to carry the geometrical method into all branches of science. It was used by Descartes and his extensively ramified school in philosophy, and also in theology. Assuming the existence of thought, of *cogito*, as a truth which cannot be doubted, he thence proves his own existence, which it would have been wise in him to assume; and then, from the idea of the infinite and the perfect in the mind, he argued that there must be a perfect being existing, whose veracity guarantees our idea of matter.

Samuel Clarke, finding that man could not get rid of the idea of space and time, argued that, since all things must either be substances or modes, and

as space and time are not substances, they must be modes of a substance, which is God, whom, by other considerations, he clothes with benevolence. In these connected systems doubtful definitions were carried out, often by right reasoning, to very doubtful results.

I may refer particularly to the wrong application which was made of this method by Spinoza, the Dutch Jew designated expressively by Dugald Stewart "the thought-bewildered man." In his *Ethics*, beginning with a formidable array of definitions, axioms, postulates, and corollaries, he draws out a philosophical religious system in which God is at once extension and thought, and being THE ALL is the moral evil in the world as well as the good; is, in fact, the deceit, the hypocrisy, the adultery, as well as the true, the upright, the holy. A number of powerful German thinkers, metaphysicians, and theologians, toward the end of last century, became greatly enamored with the pantheism of Spinoza, and several of them drew out systems of much the same kind. All agreed in proceeding *à priori* in deducing results from favorite principles. They all drew much from, indeed, proceeded upon, favorite fundamental principles, and drew out imposing systems all more or less idealistic and pantheistic. The ablest of the speculators were

Fichte, Schelling, culminating, and, it is to be hoped, terminating, in Hegel. They have been followed by several dozen others, such as Herbart, Lotze, and, we may add, Schopenhauer and Von Hartmann, all of whom adopt some new principle and carry it out in the same way. The newest form is Neo-Kantism, which, however, can never reach the truth till it abandon certain fundamental principles of Kant, such as that we perceive mere phenomena in the sense of appearances, instead of things; and that the mind adds forms to things when it perceives them. These systems have had their day, which, it is hoped, is now coming to a close. It is hoped that they will never become the prevailing philosophies in England, France, and America. In Germany they have buried beneath them some of the simple truths of Scripture and natural piety. The fundamental objection to the method is that it is not applicable to the sciences, which have to deal with facts. The method is a powerful one when we have the legitimate means of using it, that is, self-evident truth. But it is not available when we have to observe and co-ordinate the facts of nature within and without us. Our philosophic physicists are quite aware of this. Our metaphysicians should acknowledge the same truth. "A clever man," says Herschel, "shut up alone and allowed unlimited time, might

reason out for himself all the truths of mathematics by proceeding from those simple notions of space and number of which he cannot divest himself without ceasing to think. But he could never tell, by any effort of reasoning, what would become of a lump of sugar if immersed in water, or what impression would be left on his eye by mixing the colors of yellow and blue." (*Natural Philosophy*, 67.)

II.

The Joint Inductive and Deductive Method.

J. S. Mill argues that more progress will now be made, even in observational sciences, by deduction than by induction. This may be doubted. It seems to me that observation and experiment must always be the surest way of advancing research. But deduction may be joined to induction. When this is done the method may be called the Joint Inductive and Deductive. This is, in fact, the method represented by Mr. Mill as conducting to such fruitful results.

In this method the inquirer begins in the inductive method; that is, he observes facts with care and with the view of discovering a law. As he proceeds he will ever be asking whether the law is so and so; that is, devising an hypothesis. In order to determine whether this is a true law of nature

he has to examine further facts; it may be, facts of a different kind. As he acts thus he may find he can apply deduction. He inquires what effects follow from the law in his mind, and he then compares these with the facts. If he finds these to correspond he has a verification of his hypothesis. It is by combining the two in this way that the greater number of the established laws of nature have been discovered. In most cases there have been long processes, both of induction and deduction, before the law has been ascertained and adjusted. When the laws of nature are quantitative, as they commonly are, mathematics may be applied to them, and it becomes the instrument of the deduction; and often a far-reaching one—showing very distant consequences which can be compared with facts.

In the sciences of observation sometimes the inductive element and sometimes the deductive method is the more prominent; in all cases the inductive, as I reckon, is the essential. In Galileo's researches experiment was the main instrument, but he also used mathematics. Kepler's fertile mind was always devising hypotheses, but he accepted them only as they were confirmed by observations. It would be wrong to say that Newton's method was mere induction. He had before him

the observations of Galileo and Kepler, and also a measurement of the distance of the earth's surface from the center, and he applied a powerful mathematics, created by himself, to these facts. It is a circumstance greatly to his credit that when, having a wrong measurement of the distance of the earth's circumference from its center, he found his theory, that the moon was held in her sphere by the same power as draws an apple to the ground, not to be in accordance with facts he gave it up for a time, and only resumed it when it was found, on the proper distance of the earth's surface being ascertained, that the facts corresponded. In all departments of physics or natural philosophy the deductive mingles with the inductive. In optics, in thermotics, in theoretical astronomy, in mechanics, the deductive or mathematical element has a conspicuous place; but in all these sciences we have always to start with observed facts. In ethics we carry out indefinitely the laws of our moral nature; but these have been ascertained by a previous observation of that nature. In like manner, in logic we deduce consequences from the laws of discursive thought, which we have found by observing how they act in the mind. In all the social sciences there is a mixture of the two elements, sometimes one and sometimes the other being

predominant. Jurisprudence is forever appealing to fundamental principles, and inquiring how they apply to a given case. The science of national wealth must be constructed mainly by the observation and collection of facts in statistical and other forms; but there are universally operating principles ever called in. Thus it is supposed that men are usually swayed by a desire to promote their interest so far as they know it. This is certainly a powerful motive. But there are others, such as the desire for fame, for power, for society, for the beautiful, for promoting education and religion, all actuating individuals, and the influence may be traced in the progress of nations. In chemistry the laws have to be ascertained by observation, particularly by experiment; but when principles have been discovered, such as that of affinity, they may be carried out indefinitely. Psychology, as a science, is constructed mainly by the observations of consciousness; but, having ascertained certain laws, such as those of the association of ideas, we can explain how they affect our beliefs and feelings. In pedagogics, or the science of teaching, we must carefully observe the ways of children; but in doing so we discover their actuating motives, such as the love of knowledge, the love of play, the love of approbation, which have to be taken into account in

constructing our methods of instruction and discipline. In æsthetics there are ascertained laws of taste which must be taken along with us in the construction of the science. In all departments of natural history observation must play the most important part, but there are laws of life and of form to guide biologists in all their investigations.

The principles from which we deduce conclusions are of two kinds. Some are self-evident or demonstrative. Such are moral laws and maxims. These are assumed, and are applied extensively and constantly in history and in all the social sciences; in all sciences which deal with motives and character. Of this description is the maxim that men are likely to be happy and comfortable when they are moral. To this same class belong all mathematical propositions founded on axioms. These self-evident truths are seldom formally enunciated; they are simply assumed and applied. So far as science uses them it is very much employing the Joint Dogmatic and Deductive Method. But there is a second kind of principles used in deduction even more extensively; these are acknowledged truths and wise laws established by a large induction. For example, any one may now assume the law of gravitation. In optics it is allowed that the angle of reflection is equal to the angle of incidence, and

from this a great many particular truths may be drawn. In chemistry it is taken for granted that the elements combine in certain proportions, and from this a multitude of consequences follow.

In this joint method the induction is tested by the canons of induction and the deduction by the rules of reasoning.

III.

Hypotheses and Verification. Consilience of Inductions.

"*Hypotheses non fingo*," said Newton, meaning, perhaps, that he introduced no fictitious agency, but merely *veræ causæ*, such as existed in nature; or, more probably, that he accepted no truth till it was established. Since Newton's time, especially within the last age, hypotheses have played a very important part in all departments in which the laws have not been settled, as, for example, in electricity and biology. The investigator is bent on knowing what laws certain phenomena follow. But in nature divers agents are mixed up with one another, and he cannot determine what they are by a loose inspection. As he observes tentatively, he makes a supposition suggested by the facts as to what the law should be. When he notices the descent of plants and animals he says to himself, Let us sup-

pose the law to be that of development or heredity. He has now a specific end to work for, and he observes and collects facts, and inquires whether they agree with the hypothesis he has formed. If he finds that many of them do so he has a probability, and is encouraged to proceed; and if the hypothesis explains a large body of events it rises to the rank of a theory. When it takes in all the facts bearing on the particular case, and no exceptions can be discovered, it is regarded as a law of nature, which, however, may require to be modified and adjusted before it suits all the facts, and so becomes the true law. This process is called

The Verification of Hypotheses.—When first suggested the supposition may have little to support it, and there may seem to be facts opposed to it. But if it is the correct one there will come confirmations from a variety of quarters, difficulties will disappear, and the seeming exceptions may corroborate it. The hypothesis started is that light consists in vibrations, not a very probable supposition beforehand, but then it is found to explain one set of phenomena after another, till at last it seems to account for every thing, and is counted as an established law. Or the hypotheses is that of the conservation of energy, or that the amount of energy in the world, real and potential, cannot

be increased or diminished. On the first consideration of this view obvious objections will present themselves. We strike with a hammer upon a piece of iron till our strength is exhausted, and it looks as if force had been expended and lost. But, on further inquiry, we detect the energy that had gone out of the body to be conserved in the molecular motion or heat of the metal.

Hypotheses, I rather think, must be resorted to in the early stages of the investigation of every sort of phenomena. They are simply tentatives, and most of them may have to be abandoned. They may or they may not be announced; they may in the first instance be simply guesses, and only a few or one of them prosecuted to any great extent. The law of gravitation was, for a time, only an hypothesis, taking the erroneous form that matter attracts other matter, not according to the square of the distance, which is the true law, but according to the distance. Hypotheses are necessary, but are to be carefully watched and limited.

First.—The hypothesis must be suggested by the facts and not be feigned by the mind; this may be the meaning of Newton's statement.

Second.—It must be regarded as a mere hypothesis till it is established by the criteria applicable to the department. We are much troubled in the

present day by hypotheses being represented as established laws.

Third.—The hypothesis is to be abandoned when it is found that there are facts inconsistent with it. It requires much courage to abandon an hypothesis which has long been cherished, and, perhaps, published to the world.

Fourth.—It is established as a law when it explains all the phenomena bearing on the subject and is not contradicted by any known fact.

It is a powerful confirmation of an hypothesis when it enables us to predict occurrences. If the alleged law be the true one the facts will correspond to it in the future as in the past, and as they fall out will tend to prove that the hypothesis is a sound one. Dr. Whewell has shown that the evidence in favor of our induction is of a much higher and more forcible character when it enables us to explain and determine cases of a kind different from those which were contemplated in the formation of our hypothesis. "Thus it was found by Newton that the doctrine of the attraction of the sun varying according to the inverse square of the distance, which explained Kepler's third law, of the proportionality of the cubes of the distances to the squares of the periodic times of the planets, explained, also, his first and second laws, of the ellip-

tical motion of each planet, although no connection of these laws had been visible before. Again, it appeared that the force of universal gravitation, which had been inferred from the perturbations of the moon and planets by the sun and by each other, also accounted for the fact, apparently altogether dissimilar and remote, of the precession of the equinoxes." He designates this process as the Consilience of Inductions. He declares: "No example can be pointed out in the whole history of science, so far as I am aware, in which this consilience of inductions has given testimony in favor of an hypothesis afterward discovered to be false."

IV.

CHANCE.

In one sense there is and can be no such thing as chance; that is, an event without a cause or without a purpose. Every occurrence has a cause in God. Not only so, but in the ordinary affairs of this world it has a mundane cause. Further, it falls out according to the uniformity of nature.

But there are senses in which there is chance in our world. The oldest definition of chance (τύχη) was by Anaxagoras, who makes it an event whose cause cannot be discerned by human reason (λογισμός). This account needs only to be a little

expanded and made more definite. There are occurrences of which the cause or the law is unknown, and, in consequence, we cannot anticipate their occurrence. This may arise from the cause being utterly unknown to us. More frequently it arises from the complexity of nature, from there being a number of agents working, or from the nature of their operation. We may know all the agencies at work, but we cannot tell how they are working. In all cases the events do not recur with such regularity as to constitute a law. There was a time when eclipses were regarded as coming according to no law, and men, following the law of causality, referred them to a deity. When these causes were discovered they were found to have periods, and astronomers could predict their recurrence, and they were viewed in a different light. Till lately meteors were supposed to appear capriciously, but now showers of them are expected at certain seasons of the year, and nobody ascribes them to chance. When we shake a die in a dice-box we are acquainted with the mechanical law which it obeys in its movements, but we cannot say which side will cast up. We know, in a general way, what physiological agencies produce death, but we cannot predict at what precise time any man will die.

Still, even in such cases, a certain kind and amount of truth may be had, and this from the circumstance that the event proceeds, after all, from causes which operate regularly, and from there being a limited number of causes. We find that, given a sufficient number of trials, each side of the die will come up the same number of times; if any side comes up more frequently than another we argue that the dice have been loaded. We do not know when any one man will die, but we can ascertain what number of people will die in a given time in a community.

In such cases we can strike an average, and we can foretell average results and estimate the probability of a given event. When we speak of the probability of an occurrence we are not to understand this as implying the uncertainty of the occurrence considered in itself. The event, say the death of a person on a certain day, may be absolutely sure, owing to causes operating. We can conceive that there are higher intelligences to whom it would not be uncertain. We are sure that it would not be so to the view of the Omniscient. It is so to us because of the limited nature of our faculties and of our knowledge of the causes operating. Were we cognizant of all the antecedent circumstances we might, in many cases, be able to

predict the result. It is because of our ignorance that the event is uncertain to us. The probability or improbability is not in the event, but in the grounds which we have for expecting it; it is subjective and not objective.

In all cases we must have certain data, gained by observation and yielding a general average. In some departments we can express numerically the probability or improbability of the particular occurrence. An event reckoned impossible may be represented by 0; an event certain to happen, by 1. All degrees of probability may be denoted by the fractions representing value from zero to one. The probability of an uncertain event is represented by the number of chances favorable and unfavorable. Thus the casting up of a head or a tail being 1, and the chances against it being 2, the proper chance is one half. The tables that have been prepared for life insurance companies have been very elaborate, but need not here be given.

There is another sense in which it may be said that there is such a thing as chance. There cannot be an occurrence without a purpose on the part of God, who has ordered the causes producing it. But there may be a concurrence without a design. It is by chance that certain rocks take the form of the face of Napoleon or Wellington. I do not know

that there was any purpose designed or effected by so many men of genius being born in the year 1769, or by Cervantes dying on the same day as Shakespeare died. There are certain minds that take the keenest interest in observing such coincidences, and discover a deep meaning in what is in itself meaningless; for example, connecting a calamity with the spilling of salt at a table, or from thirteen persons meeting at that table. On the other hand, when there is an immense congregation of agents that are independent, to produce an evident benevolent end—for instance, of vibrations of light, of coats and humors, of rods and cones, to enable us to see through the eye—there is evidence of design, the chances being all against such a concurrence.

V.

Natural Theology.

Attempts have been made to conduct this science on the joint dogmatic and deductive method, but, in my opinion, without much success. It has to deal with facts—the existence of God, and the immortality of the individual soul—and, therefore, must have an inductive or observational element. I have my doubts whether, from a mere idea or principle in the mind, we can argue the existence of the living God. It should proceed, I reckon, mainly in

the joint inductive and deductive method. It looks at God's works within and without us, and, discovering wonderful mutual fittings, means and end, traces of love and just government, it rises to the belief in a being of power, wisdom, benevolence, and justice. The inductions are collected in such works as Ray's *Wisdom of God*, in Paley's *Natural Theology*, in the *Bridgewater Treatises*, and the ordinary works of natural religion.

But there are deductive processes involved. The premises here are supplied mainly by *à priori* principles or by intuition, all to be justified by the criteria of First Truths. In the mind of man there are high and deep truths in the germ, all capable of being developed and actually working in the mature man, being called forth by the circumstances in which he is placed. There is the principle of causation, requiring us, on a new thing or a change appearing, to seek for a cause. This can stand the tests of intuition, being self-evident, necessary, universal, in our very nature and constitution; and it leads us to believe that where there are traces of design there must be a designer. There is a moral power within us, with its law and its obligations, implying a law-giver. We have not an adequate idea of infinity, but we believe that there is something beyond our widest idea or concept, something

to which nothing can be added, and we are led to apply it to the powerful, the good and holy One.

We are entitled, we are required, to trust and follow these principles. They are elements, and the highest elements, of the reason with which we are endowed. We begin with trusting the senses, and find, as we do so, constant confirmations in our daily experience; what appeared at first to be realities we discover to be more real as we bring one sense after another to bear upon them, and find that meat nourishes us and pure air refreshes us, and the due use of the good things of this world prolongs life. We should confide in the same way in our higher ideas and beliefs, and as we do so we find them expanding and elevating the mind, opening grand vistas which look beyond the seen and temporal into the unseen and eternal. If we do not follow our lower instincts, if we do not eat and drink, our bodies will become feeble and die; and if we deny our higher reason our souls will lose their freshness, vigor, and aspirations.

But when we would construct the argument, indeed, in all scientific investigations and in all true philosophy, we must be careful to ascertain the exact nature of the intuitions or intuitive reason we call in, and only use them accordingly. Those who neglect this are sure to present them in an extrav-

agant form or make a perverted use of them. This has been done by the mystics of the East and of mediæval times, indeed, of all ages. Almost always they have got a glimpse of a reality, but they have seen it only under partial aspects, and they have shown it to us through a cloud, or irradiated it with reflected light, and have represented it to us as vision, inspiration, and ecstasy, whereas it is only one of the higher elevations of our nature.

All our profound thinkers have seen these truths, but have not always properly represented them. We may hold with Plato that there is a grand, indeed, a divine, Idea; but I wish that idea, as in the mind, carefully examined and its forms or law exactly determined, and it is for inductive science, and not speculation, to tell us what are the types which represent it in nature. I hold with Aristotle that there are formal and final, as well as material and efficient, causes in nature; but it is for a careful induction to determine the nature of these and to show how matter and force are made to work for order and for ends. I am as sure as Descartes, and as Augustine and Anselm were before him, that there is in the mind a germ of the idea of the infinite and perfect; but we must show what is the precise nature of the idea, so as to secure that we draw only legitimate inferences from it. I discover,

as Leibnitz did, a pre-established harmony in nature, but it consists mainly, not in things acting independently of each other, but in the harmony produced by things acting on each other. I attach as much importance to experience as Locke did, but I maintain that observation discovers that the intuition (which he acknowledged) looks at principles in the mind prior to all experience. I allow to Kant his forms, his categories, and his ideas, but their nature is to be discovered, not by criticism, but by induction, when they will be found not to superinduce qualities on things, but simply to enable us to perceive what is in things. I believe with Schelling in intuition (*Anschauung*), but it is an intuition viewing realities. I hold with Hegel that there is an Absolute; but I believe that our knowledge, after all, is finite, implying an infinite, and that the doctrine can be enunciated so as not to issue in pantheism. I turn away with scornful aversion from the pessimism of Schopenhauer and Von Hartmann, but I believe they have done good by calling attention to the existence of evil, to remove which is an end worthy of the labors and suffering of the Son of God. I believe, with Herbert Spencer, in a vast unknown above, beneath, and around us; but I rejoice in a light shining in the darkness and revealing the known. I believe in the gems so rich

and varied which the higher poets have left us as a rich inheritance; but before they can enter into philosophy they must be cut and set, and it will require a skillful hand to adjust them, and when they are cut it must be as skillfully as diamonds are, and this only to show more fully their form and beauty.

VI.

Limits to Human Knowledge.

The aim of this treatise has been to show that the human mind is capable of reaching knowledge, and that it has tests to determine when it has done so. I have faced the agnostic, but have not entered into a wrestling with him, which would be endless, because he refuses to take a form by which I may lay hold of him. I have pursued a more effectual method. I have shown objects where he assures us that there is nothing. It is in this way we can command assent and gain assurance.

I have proceeded on the idea that there is a difference in the certitude of truths. Some I have shown are self-evident, necessary, and universally held, and therefore certain beyond doubt or dispute; others are only probable, some with only a slight balance in their favor, others rising to certainty. This is not so much a difference in the truths as a difference in the evidence to us. To God and to

higher beings, the one kind may be as certain as the other. We cannot tell whether there will or will not be a good harvest next year. But to Omniscience it may be as certain that there is to be a good harvest as that all the angles of a triangle are equal to two right angles. It is of vast moment that we should know what kind of evidence we have, and what the validity of the evidence which we have in favor of any proposition we are required to believe, whether it is demonstrative or merely probable, and if only probable what the degree of probability. It is also of moment that we should note what kind of truth admits of apodictic and what of only probable proof. It is vain to seek for demonstration in every kind of investigation. We can have such, as I reckon, only when we have self-evident truth. But, then, it can be shown that inductive truth can rise to certainty. I doubt much whether we have immediate evidence of the existence of God as we have of the existence of ourselves, but we have quite as valid proof of the existence of God as we have of the existence of our fellow-men. In both we have a fact, the acts done, and we rise up by the principle of causation to a cause. The criteria of truth which I have been furnishing should assist us in all such investigations.

Man's knowledge is increasing and must continue

to increase. His generalizations widen as his knowledge increases and take in more and more objects. He is constantly gaining more premises which lead to farther conclusions. One discovery leads on to another; one chamber opened shows us the door which opens into a second. Davy proved the correlation of electric and magnetic forces; Oersted of electric and magnetic, and at last the grand doctrine disclosed itself to a number of investigators, particularly to Mayer, that all the physical forces are correlated.

But man's power of discovering truth is, and ever must be, limited. First, there are limits to his mental powers. He has only five original inlets of knowledge into the material world. Had he fifty senses instead of five he might know vastly more. Then, his power of working on the materials required by sense and consciousness, his memory and his understanding are also limited. Some men can discover more truth than others, and it is conceivable that there may be higher intelligences who see farther into the nature of things than the most far-sighted of men. Secondly, every man's individual experience is limited, and the same may be said of the experience of the race—it is confined within very stringent bounds.

Man can discover a vast amount of truth, spec-

ulative and practical. We have enough revealed to exercise our faculties, to expand and elevate the mind, and to serve for all the purposes of the duty we owe to God, to ourselves, and our fellow-men. Every truth known leads however into the unknown. But this is to tempt us to penetrate into the unknown region that we may know it.

As we do so we shall find that there are things beyond our ken in a region beyond, above, or beneath us, and we must be content to allow them to lie there. We know as much as to know that there are truths which we cannot know. We see the objects within our proper range of vision, but we also see the darkness that encompasses them. "We know in part." Yes, we know, but we know only in part.

We who dwell in a world "where day and night alternate;" we who go every-where accompanied by our own shadow—a shadow produced by our dark body, but produced because there is light—cannot expect to be absolutely delivered from the darkness. Man's faculties, exquisitely adapted to the sphere in which he moves, were never intended to enable him to comprehend all truth. The mind is in this respect like the eye. The eye is so constituted as to perceive things within a certain range, but as objects are removed farther and farther from us they become more indistinct, and at length are lost sight

of altogether. It is the same with the intellect of man. It can penetrate a certain distance and understand certain subjects, but as they stretch away farther they look more and more confused, and at length they disappear from the view. And if the human spirit attempts to mount higher than its limited range it will find all its flights fruitless. The dove, to use a well-known illustration of Kant's, may mount to a certain height in the heavens; but as she rises the air becomes lighter, and at length she finds that she can no longer float upon its bosom, and should she attempt to soar higher her pinions flutter in emptiness and she falters and falls. So it is with the spirit of man: it can wing its way a very considerable distance into the expanse above it, but there is a boundary which if it attempts to pass it will find all its conceptions void and its ratiocinations unconnected.

Placed as we are in the center of boundless space and in the middle of eternal ages, we can see only a few objects immediately around us, and all others fade in outline as they are removed from us by distance, till at length they lie altogether beyond our vision. And this remark holds true not only of the more ignorant, of those whose eye can penetrate the least distance, it is true also of the learned—it is perhaps true of all created beings—that there is a

bounding sphere of darkness surrounding the space rendered clear by the torch of science. Nay, it almost looks as if the wider the boundaries of science are pushed, and the greater the space illuminated by it, the greater in proportion the bounding sphere of darkness into which no rays penetrate; just as (to use a very old comparison) when we strike up a light in the midst of darkness, in very proportion as the light becomes stronger so does also that surface dark and black which is rendered visible.

CHAPTER FIFTH.

TESTIMONY. IS IT SUFFICIENT TO PROVE THE SUPERNATURAL?

I.

IT is not necessary to suppose, with some of the Scottish metaphysicians in their answers to Hume's argument against miracles, that there is an original instinct or principle of common sense leading us to trust in testimony. I believe, indeed, that there is a social instinct in all of us inclining us to have an affection for, and trust in, those we meet with, especially in father and mother, brothers and sisters, and leading us to believe in what they say. But the belief in testimony is the result of experience, and is modified by experience; we trust in certain testimonies, but not in others. There is a conscience in every man which disposes him, if he does not resist it, to speak truly; even selfishness prompts him not to lose the confidence of his fellow men by deceiving them. Hence the great body of mankind speak the truth when they are not led to act otherwise by a desire to excuse themselves, or by malignity toward their neighbor, or

some other like motive. We can reach truth by means of testimony. It was in his haste that David said, "All men are liars."

The testimony of one man is often sufficient, because of his character, known otherwise, and because he has no motive to deceive. We lay down rules for our guidance in judging of testimony, as that it is a good sign if the statements are direct and unartificial. In most cases we seek to have the testimony of one man confirmed by another, that in the mouth of two or three witnesses every word may be established, it being shown that there has been no collusion or conspiracy. There are commonly circumstances which corroborate or detract from the testimony. Circumstantial evidence is at times sufficient to prove that a prisoner has been guilty when there is no direct evidence of the act. In witness-bearing, books of law and judges on the bench lay down rules which may guide the jury in the verdict which they bring in.

History.—Here the evidence is mainly that of written testimony, which, however, may be confirmed by original historical documents, such as monuments, inscriptions, coins, and ancient charters. Laplace, misled by a false analogy derived from the diminution of light when reflected successively from a number of surfaces, declares that the value of

testimony may be weakened by transmission, and at length altogether lost. (*Essay on Prob.*) This is true of tradition, that is, of oral testimony transmitted from mouth to mouth, or from age to age; but Sir G. C. Lewis (*Meth. of Obs. and Reas.*) has shown that "when the testimony of the original witness has once been obtained, and recorded either by himself or others in an authentic form, it is perpetuated so long as the written memorial of it is preserved in the original, or in a faithful transcript, and may at any time be used for historical purposes."

I am to show that testimony is fitted to establish the occurrence of supernatural as well as natural events. In opening the subject it is essential to determine what the natural is, and what the supernatural is, especially in their relation one to another.

II.

THERE IS A NATURAL SYSTEM. In seeking to find its nature let us recall the distinction drawn in Lecture iii; the Laws of Causation and the Laws of Uniformity. In the former there is power in the cause to produce the effect. I believe there is an intuitive conviction which perceives this, but it is not necessary to our present purpose to insist on this. It is enough that a long, a combined, an un-

contradicted experience testifies to the universality of causation. Let it be observed that this means that every event has a cause in some mundane agency, such as gravity, or electricity, or magnetism, or chemical affinity. I believe that every occurrence has a cause in God, but also that it proceeds immediately from a power imparted to created objects. God is the author of the seasons, but he produces them by the relation of the earth and the objects on it to the sun.

Causes are so organized that they lead to general results; what I call laws of uniformity. The earth is so related to the moon that the tides are produced with their regular times. There is no causation implied in their succession; the incoming wave does not produce the receding wave, nor, *vice versa*, does the retiring wave produce the next advancing wave. Many of these laws are simply co-existences, in which the agents exercise no influence on each other. Even in cases of succession the antecedent does not produce the consequent. Thus day does not produce night; both are the issue of causes beyond them. People often speak of a law necessarily producing an effect; this is true only of the laws of causality.

By the arrangement of these causes there is a natural system.

1. Every substance in nature is endowed with certain properties, original or derived. Thus the soul is possessed of powers of consciousness, of sense-perception, and feeling. Bodies continue in the state in which they happen to be, whether this be motion or rest, unless they be influenced by powers *ab extra;* all bodies attract each other inversely according to the square of the distance; the elements combine according to definite proportions; light is propagated by vibrations; action is equal and opposite to reaction; in polar forces like repels like, and attracts unlike; these are samples of properties which may be simple or may be complex, but are, at all events, natural properties. These properties consist essentially in *tendencies;* not in acts, but tendencies to act on the needful conditions being supplied. Thus oxygen has the tendency to combine with hydrogen, and does combine with it, when the hydrogen is presented in the proper mode. Thus it is the tendency of fire to burn when fuel is presented, and the tendency of a dead animal body to decay. It will be shown, as we advance, that this tendency is never, properly speaking, interferred with in any of the miracles of Scripture. But our present aim is simply to bring out what is the cosmical system.

2. The substances and their properties are cor-

related and distributed so as to produce a general and an obvious order. This is effected by the arrangement of the substances with these properties so as to produce here a contemporaneous order, and there a regular succession of phenomena which can be observed for scientific and for practical purposes. Of this description are the apparent motions of the sun, moon, and stars in the heavens, the seasons for sowing and planting, for reaping and gathering in fruit, the stages in the life of the plant, and a hundred other periodical laws which human beings can observe, more or less easily, by science or without science, and to which they can accommodate themselves, and, as they do so, secure the blessings which nature has provided. All this order arises from arrangements among the substances with their powers. With other distributions and collocations of natural agents there might be no general laws or the general laws would be different. The actually existing laws are admirably adapted to the constitution of man; to his intellectual powers, which delight to discover class and cause, and the relations of means and end, and also to his practical convenience, as enabling him to anticipate the future from his experience of the past. It is very conceivable that these laws may be in themselves an end contemplated by God, and

pleasing to him as he surveys them. It is certain that they are a means toward a farther end, a means of making creation intelligible to the intelligent creature, and capable of being used for practical purposes.

3. There is a large yet limited body of objects and powers, constituting nature and performing its functions. I believe that the substances, with their properties, have all been created by God, and also that all their natural relations and dispositions have been instituted by him. No human power, no natural power, can add a new substance to nature, or destroy any existing substance; we may burn the hay or stubble, but it is not thereby annihilated; one portion has gone up into the air as smoke, another has gone down to the earth as ashes. Not only so, it seems to be established by the latest science that power cannot be created or lost, and that the sum of force in the world cannot be increased or diminished by natural means. We may transform one natural force into another, or make one natural force produce another; but in all the mutual action of bodies the sum of the potential and actual energies is never altered. Not only is it beyond created power to create or annihilate new bodies or substances, it is beyond all natural power to create or annihilate force. Nature is a self-com-

prised system, globe, or sphere; *in se ipso totus, teres, atque rotundus.*

In saying so, it is not meant to assert that this sphere has no points of contact or relationship with other compartments of creation, and, still less, that it has no dependence on a higher and a supernatural power. All that we maintain is, that it has a number of agencies which, in their totality, combination, and action, constitute the system of nature. A miracle, we shall see, does imply the interposition of a power beyond this mundane sphere. It serves its end because it is the effect of a supernatural cause.

But, meanwhile, let us understand precisely what is meant when it is said that nature is a self-contained system. Let us not suppose that it has been proven that it needs nothing to support it, and that it will go on forever if left to itself. The geologist, in his diggings, has gone a little beneath the surface, but has not reached the bottom in his explorations; he has gone back many ages, but has not reached the beginning, which ever retreats from him. The astronomer has penetrated to great distances, but he has not reached the outside; he is just impressed the more with the vast circumambient region into which his telescope cannot penetrate. Science in all its explorings knows not when the

beginning was, nor when the end shall be; knows not where the center is, nor where the circumference is—if, indeed, there be a circumference. This knowable world, however large and complete, is not, after all, the universe, but only a part of it; whether we follow it behind or before, above or beneath, on the right side or the left, it is seen to be broken off; beginning we know not when, ending we know not where, but certainly not when and where our vision fails: it looks hung from above, and resting below, on nothing discernible by physical science. There is clear evidence that things have not always been as they now are; there was a time, for example, when man was not on the earth; an earlier time when there were no animals on the globe. There is no evidence that there are physical agencies in the world which would keep it existing forever. The continental mathematicians of last century thought they had gone a step beyond Sir Isaac Newton, and demonstrated that, according to laws now in existence, the machine would go on through all eternity without requiring to be wound up or receiving any aid from without. All that they proved was that there is a beautiful self-adjusting or self-regulating arrangement in the solar system which secures that the obvious variations of the motions of the planetary bodies are periodical.

Later inquiry has shown that there are agencies now operating which must in the end dissipate the whole existing order of things; and the most advanced science has discovered no natural means of counteracting the destructive tendency. The following are the conclusions drawn by Professor W. Thomson. "1. There is at present in the material world a universal tendency to the dissipation of mechanical energy. 2. Any *restoration* of mechanical energy, without more than equivalent dissipation, is impossible in inanimate material processes, and is probably never effected by means of organized matter either endowed with vegetable life or subjected to the will of an animated creature. 3. Within a finite period of time past the earth must have been, and within a finite period of time to come the earth must again be, unfit for the habitation of man as at present constituted, unless operations have been, or are to be, performed which are impossible under the laws to which the known operations going on at present in the material world are subject."*

All events happening according to the uniformity of nature can easily be established by the mouth of two or three witnesses.

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* *Transactions of the Royal Society of Edinburgh*, 1852.

III.

THERE IS A SUPERNATURAL SYSTEM. It is in the midst of the natural system, to which it is adapted, and the two go on in co-operation.

It may be said to begin with the creation, which is supernatural, and necessarily before the natural, which is its product. Sin enters into the government of the holy God, and it is announced to the tempter, Gen. 3. 15, "And I will put enmity between thee and the woman, and between thy seed and her seed; it shall bruise thy head, and thou shalt bruise his heel." This is an epitome of the history of the whole world. There is a deliverer, who is the seed of the woman, but with vast power to crush the head of the serpent, that is the evil; in short, at once human and divine. Henceforth there is a struggle and a contest between the powers of evil and of good, with God in the midst of it to restrain the evil and secure in the end the victory of the good. This is the present state of our world, as we see it all around us and feel it in the depths of our hearts.

In the midst of the natural the supernatural has its place. As types reign in the vegetable and mineral kingdom so they also run through the kingdom of grace. There is the tree of knowledge of good and evil, representing the contending powers

in the world, and also the tree of life for the healing of spiritual diseases. Enoch is translated to keep alive a belief in immortality. Some are saved by an ark in the overwhelming deluge. Abraham is called out of a world fast falling into idolatry to keep alive the knowledge of the truth. There is the establishment of a commonwealth under the immediate care of God; there are prophets, speaking in the name of God, giving lessons for the present and opening glimpses of the future. There is a captivity in Babylon followed by a deliverance, and a scattering of the Jews with their Scriptures for the wide diffusion of the Gospel. In the fullness of times, in the middle of the ages, while Greece had furnished its learning and Rome its strong dominion so as to allow the messengers of the cross to spread the glad tidings, the long-expected One arrives; he fulfills his office, goes about continually doing good, he is persecuted by the Jews, is in agony in the garden, he is forsaken by the Father, and dies an accursed death, but before he expires he is able to say, "It is finished."

The death is followed by a resurrection. The work of the supernatural goes on but it is after a somewhat different manner. Miracles were multiplied while Jesus was upon the earth to testify that Jesus was above nature and had come from God.

There is no proof that there has been any outward miracle wrought since the aspostles died. The natural, being the ordinance of God, takes its course, and the supernatural helps it in the providential diffusion of the Gospel, but it is chiefly shown, or rather felt, in the hearts of men in converting and sanctifying them and in giving them peace. That is the old contest, but it is between the flesh and the spirit, in which the spirit finally prevails. "The Spirit of the Lord shall be poured on all flesh."

All throughout the Scriptures God is presented to us under one and the same aspect, as extending mercy to sinners through the sufferings of his Son. In the first promise to fallen man, the seed of the woman, who was to put his heel on the head of the serpent, is described as having his heel bruised as he does so. In the first worship of fallen man there is the offering of the bleeding lamb. You might have discovered the wandering path of the patriarchs, Abraham, Isaac, and Jacob by the altars which they built and the smoke of their sacrifices which they offered. Under the law almost all things were purified by blood. The grand object presented in the New Testament is a bleeding Saviour suspended upon the cross. It is thus the same view that is presented to us under the patriarchal, the Jewish, and the Christian dispensations. Ex-

cept in the degree of development, there is no difference between God as revealed in Eden, in Sinai, and on Calvary; between God as described in the books of Moses and God as described so many centuries later in the writings of Paul and of John. In the garden we have the law given, and indications, too, of One coming to deliver from the penalty. On Mount Sinai there is a law delivered amid thunderings and lightnings, but also ordinances which tell of an atonement for sin. In the mysterious transactions on Calvary there is an awful forsaking and a fearful darkness, emblematic of the righteousness and indignation of God, as well as a melting tenderness in the words of our Lord breathing forgiveness and love, and telling of an open paradise: "To-day thou shalt be with me in paradise." The first book of Scripture discloses to us, near the commencement, a worshiper offering a lamb in sacrifice; and the last shows a Lamb, as it had been slain, in the midst of the throne of God.

IV.

There are thus two systems. Let us look for a moment at each.

The Natural. It is not an intuitive truth, it is not self-evident, is is not necessary, it is not universal. For a long period people did not believe in

it. It has been established only within the last few ages. It is the result of a large experience and has at last been proven by science, which has found law in every department.

Thus natural points to the supernatural, that is, the existence of God. The order every-where and the adaptation of one thing to another are evidence of a designing mind. "The invisible things of God are clearly seen from the things that are made, even his eternal power and godhead." We carry this truth with us as an important factor into the consideration of

The Supernatural. It is of importance to determine precisely what this is. First, negatively, it is not a violation of the law of cause and effect or any intuitive principle in our nature, such as I have explained in the first lecture of this work. Were it so it could not be proved, could never have appeared. The supernatural has a cause, and an adequate cause, in God. This has been shown in two philosophical works written by men not prepossessed in favor of Christianity, by Thomas Brown in his work on *Causation*, and by J. S. Mill in his *Logic*. He who made the world, as his works show, continues to work in it, and may for wise and good reasons change his mode of procedure.

A miracle is an interference with the law of cause

and effect only so far as that law requires a physical cause of a physical event. It does not call in the physical cause, because there is a cause in the divine power. A miracle is an interference with the law of uniformity, the nature which I have taken such pains to unfold in an earlier part of this chapter for the purpose of enabling me to explain what a miracle is. That law is simply the result of an arrangement of causes which may be changed. It is not guaranteed by any intuitive or necessary conviction. It is simply the result of experience, and the experience which has established the natural may also establish the supernatural. It is possible, then, for a miracle to take place, and it is possible to establish it by good and sufficient evidence. Let us look at that evidence.

V.

How is it, when an ordinary ghost-story is circulated, that scientific men and educated men generally turn away from it, and will scarcely be moved to inquire into it? Because the story is contrary to the whole analogy of the system of nature, and is of a class which is believed in only by the weak and superstitious, little disposed or capacitated to investigate evidence. But why do we not turn away in the same manner from the stories recorded in the

life of Jesus? This is, in fact, the whole argument pressed upon the world an age ago in the *Essays and Reviews*, and propagated by the Arnold family, especially in their novel. The question can be answered. There is a vast difference between the two cases. The ghost-stories are totally unlike the narratives of our Lord's miracles. The ghost tales are seldom authenticated to us by clear-headed and competent witnesses. When they and the like fabulous stories are investigated by competent men on scientific principles the evidence is dissipated, as when Faraday sifted the cases of table-turning.

It is entirely different from the evangelical history. We have the testimony of four witnesses who have all the characteristics of true though sinful men, and this confirmed by the testimony of an educated man of high intellectual gifts, and by the whole history of the period, and the successful propagation of the Gospel in the earlier ages.

But it is said that in the early ages people were inclined to believe in the supernatural, and invented miracles, and that thus their testimony on this subject is not to be credited. I admit the premises but deny the conclusion. The people at the time of our Lord were ready to believe in miracles. But, I add, not in such miracles as are recorded in Scripture. They are commonly great

wonders, monsters on earth, dazzling lights in the sky. They are such as gratify the love of wonder and the superstitions of the heart.

In inquiring of lawyers and of others what is a good book on testimony, they refer me to the works of Dr. Greenleaf. He gives from the start the following rules: "The credit due to the testimony of witnesses depends upon, firstly, their honesty; secondly, their ability; thirdly, their number and the consistency of their testimony; fourthly, the conformity of their testimony with experience, and fifthly, the coincidence of their testimony with collateral circumstances." Let me apply these rules, somewhat amended, to the testimony, to the life, and especially the resurrection, of Jesus: 1. The four evangelists had means of knowing what they narrate, for they had been for several years in constant contact with him. 2. They were transparently honest, as every man sees, and had no motive to deceive, as by telling their story they only exposed themselves to persecution. 3. Their writings show that they had ability to understand what they narrated. 4. We have these four direct witnesses, besides others, whose testimony spread the Gospel over wide regions. 5. Their tale is consistent. There is enough of discrepancy to show that there could have been no previous concert among them, and, at

the same time, such substantial agreement as to show that all were independent narrators of the same great transaction as the events actually occurred. 6. Their statements are all in accordance with what is told us of the state of Judea and the world as given us by trustworthy historians such as Josephus, the Jewish, and Tacitus, the Roman, historian.

I admit the premises, but deny the conclusion. The people at the time of our Lord were ready to believe in the miracles. But, I add, not such as are recorded in Scripture. Historians and travelers tell us what kind of miracles were invented among the nations. As a specimen, take those mentioned by Livy, the historian, who lived in the age immediately before our Lord: "During this winter, at Rome and in its vicinity, many prodigies either happened, or, as is not unusual when people's minds have once taken a turn toward superstition, many were reported and credulously admitted. Among others, it was said, that an infant of a reputable family, and only six months old, had, in the herb-market, called out, 'Io, Triumphe;' that, in the cattle-market, an ox had, of his own accord, mounted up to the third story of a house, whence, being affrighted by the noise and bustle of the inhabitants, he threw himself down;

that a light had appeared in the sky in the form of ships; that the temple of Hope, in the herb-market, was struck by lightning; that at Lanuvium the spear of Juno had shaken of itself; and that a crow had flown into the temple of Juno and pitched on the very couch; that in the district of Amiternum, in many places, apparitions of men in white garments had been seen at a distance, but had not come close to any body; that in Picenum a shower of stones had fallen; at Cære the divining tickets were diminished in size. In Gaul a wolf snatched the sword of a soldier on guard out of the scabbard, and ran away with it. It rained blood in the forum at Rome. The spear of a statue of Mars, at Prænestе, moved out of its place of its own accord. An ox spoke in Sicily. An altar surrounded by men in shining garments was seen in the sky. Armed legions of spirits appeared in Janiculum." In favor of no one of these have we the testimony of a single eye-witness. They have no worthy meaning.

How different with the miracles of our Lord. We have the record by those who witnessed them. We have the testimony of the four evangelists, evidently truthful men, each giving his own account, and yet all substantially one.

Christ's work, when on earth, was a work of salvation. They brought to him the sick, the maimed,

and the blind, and he healed them all. If you had accompanied Christ on some of his pilgrimages when on earth what a glorious sight would you have seen! Not, indeed, such a scene as this world admires when it applauds the warrior with strong and healthy men before him whom it is his pride and glory to cut down and destroy. You would, if you had followed Christ, have seen a far different but a far more glorious sight. You would have seen before him, on the way by which he was to pass, the road covered with couches with the sick laid out upon them; and you would have seen the dumb, when they could not speak, striving to give expression to their woes by their earnest struggles; and you would have heard the blind, when they could not see him, crying to be taken to him. This was the scene before him; and behind him, after he had passed, were the sick bearing their couches, and the lame leaping like the harts, and the dumb singing his praises, and the blind gazing earnestly upon him with joyful eyes, and the lunatics in their right minds, and those lately dead in the embraces of their friends. Yes, these were the fruits that followed Christ's visits wherever he went. And he is Jesus Christ, the same yesterday, to-day, and forever. His office, his prerogative, is still to seek and to save that which is lost. He is in this world now

by his Spirit, as he once was by his bodily presence. He is not to be discerned by any pomp or external splendor. The kingdom of God cometh not by observation; but still we may discern him by the eye of faith. Before him are persons afflicted with all manner of soul maladies: some under the power of wild passion, by which they are led captive at pleasure, some covered all over with the leprosy of vice, all of them blind to the perception of spiritual beauty and deaf to the voice of God addressed to them. Wherever Christ goes the way is strewn with such; and wherever he goes he leaves behind him traces of his presence. Before him, as he marches through our world, are the blind, the deaf, the dying, and the dead; and behind him are the seeing, the hearing, the living, the lovely, and the loving. "The Spirit of the Lord God is upon me; because the Lord hath anointed me to preach good tidings unto the meek; he hath sent me to bind up the broken-hearted, to proclaim liberty to the captives, and the opening of the prison to them that are bound; to proclaim the acceptable year of the Lord."

The witnesses were plain, unsophisticated men. Then we have the declaration of one of the great men of the world, altogether independent of his inspiration—a scholar, a writer, an actor of great

practical wisdom. Paul, once so strongly prejudiced against the Crucified, assures us that he saw Christ in the flesh, and that he was overcome by him. The Arnolds evidently feel a sensitive shrinking from the honest, sturdy, outspoken apostle. The novelist tells us he was no reasoner. Those who can reason themselves know that in the Romans, and in all his epistles, he is one of the most powerful reasoners that ever put together premises and conclusions. At times he makes a digression, but it is as a man who steps back a few feet that he may gather force to clear the chasm.

Every man who reads the gospels has a miracle set before him in the discourses of our Lord, which, for sublime doctrine and pure precept, for grace and elevation of sentiment, for faithfulness and for pathos and for tenderness, for indignation against sin and pity for the sinner, for knowledge of the human heart, and love to men, women, and children, transcend all the highest intellects have done in Greece and Rome, and, as spoken by a Galilean peasant, are themselves a miracle.

The common Christian has not just to prove a miracle against an infidel. All that he has to do for his own conviction is to find that Christianity came from uneducated men in Galilee. This granted, the miracle follows; and he is con-

strained to say, "Thou hast conquered me, O Galilean."

VI.

"What think you of Christ? Whose Son is he?" We are obliged to think of him, and we have to answer the question, "Whose Son is he? Whence does he come?" We may suppose that he, a mechanic in Galilee, uttered all these truths, the Sermon on the Mount, and the parables, and we have already a miracle. Or, if we may adopt a more refined theory, and suppose that there was a wonderful carpenter's son in Nazareth, and that a body of fishermen on the lake constructed the Life of Christ out of him, we have a still more astounding miracle, with nothing resembling it in the history of the world.

Take one supernatural event—the resurrection of Jesus. We have as full proof of it as of any event in ancient history—say the death of Julius Cæsar, which every one believes in. We have as clear evidence that these four evangelists wrote the gospels as that Xenophon wrote the memoirs of Socrates. But the grand proof of the truth of our religion lies in the combination of evidence. We have a treble cord, which cannot be broken. How have men of science established the doctrine of the uniformity of nature? By an accumulation and

combination of observations in all departments of nature. It is in the same way that we prove that there is a supernatural system in the midst of the natural, and fitting into it. Round the life and death and resurrection of Jesus we have a body of conspiring evidences. There were antecedents and there are consequents. We have the anticipation in the history, types, and prophecies of the Old Testament. Then we have the results flowing from the belief in the resurrection of Christ, the preaching of the Gospel, the spread of Christianity in all countries, the production and fostering of all that is good in art and history, in the elevation of morals, in the establishment of schools and colleges and hospitals, in raising the status of the working classes, in the comfort imparted to poor and afflicted ones, in the converting power of the grace of God, in the slaves of the wildest passions sitting at the feet of Jesus clothed and in their right mind. All these constitute, from first to last, a unity, a system; he who would overthrow it will have to attack, not the mere outposts, but the consistent whole. It is a bounteous river system—with its waters flowing over the waste places of the earth, but issuing from the throne of God in heaven.

All these miracles are worthy of God and adapted to the state of man; with a few exceptions

they are wrought to deliver from pressing evils in our world, from disease, from sorrow, from sin. The grand end of the whole is the redemption of the soul, for which the great men of the world have labored, but have failed of their end.

Nor let it be urged that the Jewish and heathen worlds were so predisposed toward the miraculous that the early Christians had only to proclaim it to find all men believing it. For it is to be remembered that the Gentiles got it from the Jews whom they hated, and the Jews from the Galileans whom they despised.

More persuasive, if not more convincing, we have what are called the internal evidences: the suitableness of Christianity to man's nature and wants, to his felt weakness, and his sinfulness, for which an atonement has been provided; as bringing life and immortality to light, and as rolling away the great stone that closed the tomb, and opening the grave that the spirit may arise to heaven.